

# Boundless Pragmatism, An Invariant View of Deciding Well

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## Changes in Version 1998.10.7

### Preface, third paragraph, first sentence

“**Connect**” changed to “**join**.”

### Chapter 2

The subsection “Subjectivity” now appears before the subsection “Products.”

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## Changes in Version 1998.10.21

### Preface, tenth paragraph

“Again, I was inspired by Ohno’s work. At Toyota, manufacturing engineers play a different role than in traditional batch manufacturing. Instead of designing the most efficient possible manufacturing process for a given set of constraints, they design a relatively crude manufacturing system. **They design this system so that it, with their ongoing help, redesigns itself.** To do **their** open-ended job well, they must consider the means and ends of progress more thoroughly than their traditional counterparts do.”

changed to:

“Again, I was inspired by Ohno’s work. At Toyota, manufacturing engineers play a different role than in traditional batch manufacturing. Instead of designing the most efficient possible manufacturing process for a given set of constraints, they design a relatively crude manufacturing system **that, with their ongoing help, redesigns itself.** To do **this** open-ended job well, they must consider the means and ends of progress more thoroughly than their traditional counterparts do.”

### Chapter 1, “Modern Economics’ Blind Spot,” first paragraph, last sentence

“(Note that this implies a given stock of knowledge.)”

changed to:

“(Note that this implies a given **fixed** stock of knowledge.)”

### Chapter 2, first paragraph, second sentence

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“We can think of this potential decision-making process as consisting of two tasks: (1) finding the most effective problem to solve and (2) finding the most efficient solution to a given problem.”

changed to:

“The process of changing our lives for the better begins with finding a problem to solve.”

### **Chapter 2, “*Excellence*,” first paragraph, last sentence**

“Since” changed to “because.”

### **Chapter 2, “*Subjectivity*,” second paragraph, first sentence**

“A corollary of the proposition that all theories are subjective is that all theories depend on our belief in the meanings of their concepts.”

changed to:

“A corollary of the proposition that all theories are subjective is that the tenability of theories depends on our belief in the meanings of their concepts.”

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## **Changes in Version 1998.10.30**

### **Chapter 1, “*Overview*,” third sentence**

“The third and fourth chapters expand on this outline.”

changed to:

“The third takes a muddle-headed (inclusive) look at our ultimate ends and the fourth takes a simple-minded (discriminating) look at the means to them.”

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## **Changes in Version 1998.11.20**

### **Preface, sixth and seventh paragraphs**

“Traditional theories of ethics, politics, and economics ultimately rest on a set of metaphysical (unverifiable fundamental) assumptions about human nature. Finding a set that we can all agree on is impossible. Rather than founding a theory on a set of such assumptions, I propose “suspending” a set of theories from a vague description of

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an ideal end, an end so grand that virtually all of us can agree to accept it as a reasonable approximation of the ultimate end of life. As we discover more about human nature, we can eliminate members of this set. An immediate benefit of this “convergence” strategy is that it provides us with a conceptual framework that can help us find the better “tactical” problems to solve.

“I reconcile ethics and economics by redefining ‘wealth’ and ‘excellence in means.’ To understand fully the new definitions of these two key concepts requires changing one’s world-view. Thomas Kuhn compared this difficult task to trying to see the rabbit instead of the duck, or the interior instead of the exterior of a cube in one of those “trick” drawings that makes sense from either of two radically different perspectives. Until one sees the world from the new perspective, this work will likely seem to be a collection of extended tautologies or a mish-mash of conflicting ideas. However, viewed from the new perspective, it should seem both useful and relatively straightforward.”

changed to:

“Traditional theories of ethics, politics, and economics ultimately rest on a set of metaphysical (unverifiable fundamental) assumptions about human nature. Finding a set that we can all agree on is impossible. Rather than founding a theory on a set of such assumptions, I propose “suspending” a set of theories from a vague description of an ideal end. As we discover more about human nature, we can eliminate members of this set. **Note that this approach works regardless of our current beliefs. Think of how primitive fishermen return home after sunset. Regardless of where they begin, they can find their way by the lights of their village on the horizon.**

“An immediate benefit of this “convergence” strategy is that it provides us with a conceptual framework that can help us find the better “tactical” problems to solve. I reconcile ethics and economics by redefining ‘wealth’ and ‘excellence in means.’ To understand fully the new definitions of these two key concepts requires changing one’s world-view. Thomas Kuhn compared this difficult task to trying to see the rabbit instead of the duck, or the interior instead of the exterior of a cube in one of those “trick” drawings that makes sense from either of two radically different perspectives. Until one sees the world from the new perspective, this work will likely seem to be a collection of extended tautologies or a mish-mash of conflicting ideas. However, viewed from the new perspective, it should seem both useful and relatively straightforward.”

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## Changes in Version 1998.11.29

### Preface, second paragraph, first sentence

“**Dilemma**” changed to “**problem**.”

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## Preface, fourth paragraph, third sentence

“In economies with the potential for rapid change, the potential interactions between ethics (how we progress toward our ultimate ends) and modern economics (how we use scarce resources to satisfy our wants) are too important to ignore.”

changed to:

“In economies with the potential for rapid change, the potential interactions between ethics (**our ultimate ends** and how we progress toward **them**) and modern economics (how we use scarce resources to satisfy our wants) are too important to ignore.”

## Chapter 1, sixth paragraph, second sentence

“This can mislead us when we attempt to use this concept in situations in which we solve our immediate problems by **creating useful knowledge**.”

changed to:

“This **concept** can mislead us when we attempt to use **it** in situations in which we **can** solve our immediate problems by **learning to live more wisely**.”

## Chapter 1, “Efficiency and Effectiveness,” fifth paragraph, seventh sentence

“To think clearly about **our ultimate ends** we need a concept of wealth that concerns what we *need* to achieve **these** ends.”

changed to:

“To think clearly about **the latter**, we need a concept of wealth that concerns what we *need* to achieve **our ultimate** ends.”

## Chapter 3, second paragraph, second sentence

“By itself, this tautological **definition** is meaningless.”

changed to:

“By itself, this tautology is **useless as well as** meaningless. “

## Chapter 4, third paragraph, first sentence

“Pleasure and pain are mental signals that help guide us to undertake good activities and avoid bad ones.”

changed to:

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“Pleasure and pain are mental signals (or absence of mental signals) that help guide us to undertake good activities and avoid bad ones.”

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## Changes in Version 1998.12.15

### Preface, fifth paragraph, last sentence

“For **the rest** of us, it is a first cut at a plan for living and working together.”

changed to:

“For **all** of us, it is a first cut at a plan for living and working together.”

### Chapter 1, “Efficiency and Effectiveness,” first paragraph, last sentence

“**Finding**” changed to “**choosing**.”

### Chapter 1, “Efficiency and Effectiveness,” first paragraph, footnote

“The distinction between finding solutions to given problems and finding problems to solve is an arbitrary one in that we can break down any problem into **subordinate** problems. If we are to distinguish between efficiency and effectiveness, we must be careful to distinguish between problems and subordinate problems. We must choose a scale. If we fail to do so, we will become hopelessly confused.”

changed to:

“**Note that** the distinction between finding solutions to given problems and finding problems to solve is an arbitrary one in that we can break down any problem into **smaller** problems. If we are to distinguish between efficiency and effectiveness, we must be careful to distinguish between problems and **smaller**, subordinate problems. We must choose a scale. If we fail to do so, we will become hopelessly confused.”

### Chapter 2

“Newtonian **mechanics**” changed to “Newtonian **dynamics**” in all.

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## Changes in Version 1999.06.15

### Preface, sixth paragraph, last sentences

“**Note that** this approach works regardless of our current beliefs. Think of how **primitive fishermen return home after sunset**. Regardless of where they begin, they can find their way by **the lights of their village on the horizon**.”

changed to:

“**This** approach works regardless of our current beliefs. Think of how **hikers climb a hill**. Regardless of where they begin, they can find their way **to the top** by **heading toward it**.”

### Chapter 1, sixth paragraph, last sentence

Added the footnote: “**Although not generally recognized, the theoretical crisis created by this shortcoming has already arrived. The economics profession has accepted dynamic computer models that involve feedback mechanisms that affect the fitness of economic agents, e.g., Brookings Institution’s “sugarscape” models. Such models concern what economic agents *need* (to become fit) rather than what they *want*. This contradicts the generally accepted belief that economics concerns *wants* rather than *needs*. Accepting these models requires redefining the field of economics.**”

### Chapter 1, “Modern Economics’ Blind Spot,” third paragraph, fourth sentence

“Between these two extremes lies the most **efficient** order quantity.”

changed to:

“Between these two extremes lies the most “**economic**” order quantity.”

### Chapter 1, “The Recursionist Approach,” last paragraph, second sentence

Added the footnote:

“**The implicit model here is that of decision-making under uncertain conditions.**”

### Chapter 2, “Science as a Process,” fourth paragraph, second sentence

Added the footnote:

“**When scientists (and others) appear to seek the truth per se, they are actually seeking to satisfy a spiritual need. The next chapter discusses this in greater detail.**”

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## Changes in Version 1999.08.25

### Title Page

Added the subtitle: “**The Reintegration of Ethics and Economics**”

### Preface, second paragraph, third sentence

“**This great benefit introduces** an infinite element into economic calculations that changes tractable closed-ended economic models into apparently intractable open-ended ones.”

changed to:

“**The act of creating knowledge adds** an infinite element into economic calculations that changes tractable closed-ended economic models into apparently intractable open-ended ones.”

### Preface, second to the last paragraph, last sentence

“I advocate a **set of** simple-minded theories that explain causation to compliment theories that predict.”

changed to:

“I advocate a simple-minded theory **of means that explains** causation to compliment theories that predict.”

### Preface, last paragraph, second sentence

“Whether my **set of** theories is positive depends on whether it describes (as opposed to prescribes) the internal program that motivates us.”

changed to:

“Whether my theory **of means** is positive depends on whether it describes (as opposed to prescribes) the internal program that motivates us.”

### Chapter 1, “Marginalist Economics’ Blind Spot,” first paragraph, last sentences

“‘Efficiency’ means excellence in the use of scarce resources at achieving a given end: the most efficient means *to a given end* is the one that *uses the least valuable scarce resources*. (Note that this implies a given fixed stock of knowledge.)”

changed to:

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“‘Efficiency’ means excellence in the use of scarce resources at achieving a given end: the most efficient means to a given end is the one that *uses the least valuable scarce resources*. Note that this implies a fixed stock of knowledge.”

### Chapter 2, “*Products*,” fourth paragraph, second sentence

“Predictions help us evaluate alternatives: explanations help us find them.”

changed to:

“**In decision tree analysis, predictions help us evaluate decision strategies and explanations help us formulate them. In more common terms,** predictions help us evaluate alternatives and explanations help us find them.”

### Chapter 3, “*Reconciliation*,” second paragraph, third and fourth sentences

“First, belief in either the dualist or materialist system is based on faith. We currently have no generally accepted means of disproving either the fundamental materialist or dualist propositions.”

changed to:

“First, belief in either the dualist or materialist system is based on faith **in metaphysical assumptions. By definition,** we currently have no generally accepted means of disproving **these assumptions.**”

### Chapter 7

“**Statist**” changed to “**authoritarian**” in all.

### Chapter 7, “*Control the Money Supply Passively*”

This section was rewritten to emphasize how current monetary policy ignores the potential of learning.

### Chapter 7, “*Moral Vision*,” last paragraph, last sentence

“**W**hat matters most is not values and behaviors, but vision and concepts.”

changed to:

“**In a rapidly changing world,** what matters most is not values and behaviors, but vision and concepts.”



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## Changes in Version 1999.11.12

### Chapter 2, “*Products*,” last paragraph, last sentence

Added the sentence: “*Again, we need to explain based not on how we expect we will act, but on how the wise would act.*”

### Chapter 4, second footnote, last sentence

“From the recursionist view, the *fact that firms are no longer ‘firm’ is not as great a problem as* the focus is on decision-making rather than the allocation of scarce resources *within a firm.*”

changed to:

“From the recursionist view, the focus is on decision-making rather than on how firms allocate scarce resources. *The fact that firms are no longer ‘firm’ is not a problem.*”

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## Changes in Version 2000.02.25

### Chapter 3, seventh footnote, last sentence

“*Since* the process leading up to the awakening keeps us from satisfying our needs, it can be seen as an investment in happiness as well as the achievement of the ultimate temporal end of life.”

changed to:

“*The* process leading up to the awakening, *which may* keep us from satisfying our needs, can be seen as an investment in happiness as well as the achievement of the ultimate temporal end of life.”

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## Changes in Version 2000.03.17

### Preface, last paragraph, first sentences

“Economists, as scientists, ought to disregard theories if they are not both positive (*as opposed to normative*) and scientific. Whether my theory of means is positive depends on whether it describes (*as opposed to prescribes*) the internal program that motivates us.”

was replaced by:

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“Economists, as scientists, ought to disregard theories if they are not both positive and scientific. Whether my theory of means is positive depends on whether it describes the internal program that motivates us.”

### **Chapter 2, “Science as a Process,” second paragraph, first sentence**

“This blurring of modern economics and ethics is likely to upset those that view **science as a means of discovering the truth, particularly those who view science and theology as armies fighting over the truth.**”

changed to:

“This blurring of modern economics and ethics is likely to upset those that view **scientific knowledge as the only definite knowledge.**”

### **Chapter 3, last footnote, first sentence**

“Economists, as scientists, need to consider whether recursionist approach to economics outlined in this work is positive.”

was replaced by:

“**The recursionist approach to economics outlined in this work is clearly normative.** Economists, as scientists, need to consider whether **it is also** positive.”

### **Chapter 7, “Conclusion,” first paragraph**

The second sentence, “**This is similar to Whitehead’s distinction between the simple-minded and the muddle-headed.**”, was eliminated.

The last sentence:

“**The basis for this conflict of visions is the fact that decentralized decision-making is better at solving most complex problems.**”

was replaced by:

“**This conflict is one of vision, of how people perceive the world. The ‘simple-minded’ perceive a world filled with simple problems that are not being solved, hence they desire to give someone who recognizes the problems they see the power to solve them. In contrast, the ‘muddle-headed’ perceive a world filled with complex problems, which are best solved through decentralization.**”

### **Chapter 7, “Conclusion,” last paragraph, last sentence**

“**Conceptual framework**” changed to “**strategy.**”

**Changes in Version 2000.04.09**

**Preface, second to last paragraph, last sentence**

“I advocate a simple-minded theory of means that explains causation to compliment theories that predict.”

was replaced by:

“I advocate a simple-minded theory that explains causation to compliment theories that predict.”

**Preface, last paragraph, second sentence**

“Whether my theory of means is positive depends on whether it describes the internal program that motivates us.”

was replaced by:

“Whether my theory is positive depends on whether it describes the internal program that motivates us.”

**Chapter 1, sixth paragraph, footnote**

“Brooking Institution’s ‘sugarscape’ models”

changed to:

“the ‘sugarscape’ models of Joshua Epstein and Robert Axtell (Brookings Institution)”

**Chapter 2, “The Strategy for Choosing Economic Explanations,” endnote #4**

“Northrop, F. S. C., ‘Einstein’s Conception of Science’ in Paul A. Schilpp’s *Albert Einstein: Philosopher-Scientist*, The Library of Living Philosophers Volume VII, (La Salle, Illinois: Open Court, 1949).”

changed to the primary source:

“Einstein, Albert, ‘On the Method of Theoretical Physics’, The Herbert Spencer Lecture delivered at Oxford, June 10, 1933, reprinted in *Ideas and Opinions* (New York: The Modern Library, 1994).”

**Chapter 4, first paragraph, fourth sentence**

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“This is followed by” was replaced by “Next is”.

## Chapter 6, first paragraph, third sentence

“This chapter describes the complex relationship between increasing excellence, economic viscosity (**resistance to progress**), and economic turbulence (**the uneven flow of resources**).”

was replaced by:

“This chapter describes the complex relationship between **progress from** increasing excellence, economic viscosity, and economic turbulence.”

## Chapter 6, “Progress and Growth”

“Progress **and** Growth” was changed to: “Progress **versus** Growth”.

## Chapter 6, “Progress versus Growth,” second paragraph, last sentence

“those addicted to drugs gain the fortitude to change their life in ways that eliminate their desire for **mind-altering** drugs;”

was replaced by:

“those addicted to **mind-altering** drugs gain the fortitude to change their life in ways that eliminate their desire for drugs;”

## Chapter 7, third paragraph

Added the sentence:

“**This chapter considers several factors: moral vision, decentralization, lucid culture, and research.**”

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## Changes in Version 2000.05.01

### Preface, third paragraph, first sentence

“The source of this problem goes back to Adam Smith.”

was replaced by:

“The source of this (**reduction related**) problem goes back to Adam Smith.”

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## Preface, last paragraph, fourth sentence

“Where Friedman focuses on how well theories predict, thereby helping us solve given problems, I focus on how well theories help us find **better** problems to solve.”

was replaced by:

“Where Friedman focuses on how well theories predict, thereby helping us solve given problems, I focus on how well theories help us find problems to solve.”

## Chapter 1, “Efficiency and Effectiveness,” fifth paragraph, fifth sentence

“We can err by choosing an inappropriate decision-making method; by poorly choosing habits, decision rules, or subordinate ends; or by poorly identifying, judging, or implementing alternatives.”

was changed to:

“We can err by choosing **decision-making methods poorly**; by choosing habits, decision rules, or subordinate ends **poorly**; or by identifying, judging, or implementing alternatives **poorly**.”

## Chapter 2, “*Products*,” last paragraph, sixth sentence

“**In** economics,” was changed to “**Using mainstream** economic **theories**,”

## Chapter 2, “The Strategy for Choosing Economic Explanations,” last paragraph, second sentence

“Agreeing on an ultimate end is at least as difficult as agreeing on a foundation of metaphysical assumptions.”

was replaced by:

“Agreeing on an ultimate end is at least as difficult as agreeing on a foundation of metaphysical assumptions **about human nature**.”

## Chapter 2, “Science as a Process,” third paragraph, second sentence

“First, it aims at discovering what is useful **to accomplish the task at hand** rather than **trying to get at** the truth per se.”

was replaced by:

“First, it aims at discovering what is useful rather than the truth per se.”

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### **Chapter 2, “Science as a Process,” fifth paragraph, first sentence**

To maintain parallel structure within the paragraph, the phrase “explain or predict” was changed to “predict or explain.”

### **Chapter 2, “Science as a Process,” seventh and eighth paragraphs**

These two paragraphs were combined into a single paragraph. Further, sentences 2 and 3:

“The pragmatic means of testing tools is to test their performance at the task we want them to perform. **As logical and elegant narratives that explain causation,** philosophical theories are tools for helping us find problems to solve.”

were replaced by:

“Philosophical theories are tools for helping us find problems to solve. The pragmatic means of testing tools is to test their performance at the task we want them to perform.”

### **Chapter 3, “Eliminating Simplistic Theories,” fourth paragraph**

The last two sentences:

“Further, many people find this version of altruism to be selfish, which itself is evidence that this theory is incomplete. (This inadequacy is not limited to humans: news stories of family dogs sacrificing themselves to save the life of a human family member are common.)”

were switched:

“This inadequacy is not limited to humans: news stories of family dogs sacrificing themselves to save the life of a human family member are common. Further, many people find this version of altruism to be selfish, which itself is evidence that this theory is incomplete.”

### **Chapter 3, “Materialist Ultimate Ends,” twelfth paragraph, last sentence**

To maintain a parallel structure within the paragraph, the sentence:

“In response to the suffering of others, ‘ethical mysticism’ evokes sympathy, while ‘magical mysticism’ evokes detachment.”

was replaced by:

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“In response to the suffering of others, ‘magical mysticism’ evokes detachment, while ‘ethical mysticism’ evokes sympathy.”

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## Changes in Version 2000.05.21

### Preface, seventh paragraph, first sentence

“An immediate benefit of this “convergence” strategy is that it provides us with a conceptual framework that can help us find the better “tactical” problems to solve.”

changed to:

“An immediate benefit of this “convergence” strategy is that it provides us with a ‘**strategic**’ conceptual framework that can help us find the better ‘tactical’ problems to solve.”

### Preface, eighth paragraph, last sentence

“My primary objective is to provide a means for producing insights into the business of life, rather than to provide the insights themselves.”

changed to:

“My primary objective is to provide a means for producing insights into the business of life **rather than the insights themselves.**”

### Preface, second to last paragraph, last sentence

“I advocate a simple-minded theory that explains causation to compliment theories that predict.”

changed to:

“I advocate a simple-minded ‘**strategic**’ theory that explains causation to compliment ‘**tactical**’ theories that predict.”

### Preface, last paragraph, last sentence

“Examples of such integrating theories are Darwin’s theory of evolution and Wegner’s theory of plate tectonics.”

changed to:

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“Examples of such integrating, ‘**strategic**’ theories are Darwin’s theory of evolution and Wegner’s theory of plate tectonics.”

### **Chapter 2, “Characteristics of Theories,” last paragraph, last sentence**

Added the footnote:

“The wiser we are in choosing our ultimate ends and the best means to them, the less we need theories for helping us find better problems to solve. If all of us were perfectly wise (‘angels’), we would need neither governments nor such theories.”

### **Chapter 2, “The Strategy for Choosing Economic Explanations,” fifth paragraph, fourth sentence**

“This definition is inconsistent with a complete decision-oriented approach to economics, which we need if we are to consider knowledge as well as scarce resources.”

was replaced by:

“This definition is inconsistent with a complete decision-oriented approach to economics, which we need if we are to consider **all (cultural as well as technological) knowledge** resources.”

### **Chapter 2, “Science as a Process,” first paragraph, third sentence**

“To those that don’t believe this, it is merely an apology for current culture or the despoiling of the planet for the sake of producing ever more consumer goods.”

was replaced by:

“To **many** that don’t believe this, it is merely an apology for current culture or the despoiling of the planet for the sake of producing ever more consumer goods.”

### **Chapter 2, “Science as a Process,” second paragraph, first sentence**

“This blurring of modern economics and ethics is likely to upset those that view scientific knowledge as the only definite knowledge.”

changed to:

“This blurring of modern economics and ethics is likely to upset those that view scientific knowledge as the only **definitely true** knowledge.”

### **Chapter 2, “Science as a Process,” fifth paragraph, first sentence**



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“The second set involves the process of expressing our intuitive knowledge as narratives, which we use to predict or explain our sense experiences.”

changed to:

“The second set involves the process of expressing our intuitive knowledge as narratives **that** we use to predict or explain our sense experiences.”

### **Chapter 8 (“Closing Thoughts”), first paragraph, second sentence**

“To think about these interactions, we need a loose theory of means that is based on a set of ultimate ends.”

changed to:

“To think **clearly** about these interactions, we need a loose theory of means that is based on a set of ultimate ends.”

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## **Changes in Version 2000.06.04**

### **Chapter 2, “The Strategy for Choosing Economic Explanations,” fifth paragraph, fourth sentence**

“This definition is inconsistent with a complete decision-oriented approach to economics, which we need if we are to consider all (cultural as well as technological) knowledge resources.”

was replaced by:

“This definition is inconsistent with a complete decision-oriented approach to economics, which we need if we are to consider all (**‘ethical’** as well as **‘economic’**) knowledge resources.”

### **Chapter 3, last footnote**

“The recursionist approach to economics outlined in this work is clearly normative. Economists, as scientists, need to consider whether it is also positive. The answer depends on whether reverence for life is part of the internal program that motivates us. Is it our nature to revere life? We may find the answer to this question by looking into ourselves. If we had the divine power to preserve the last spark of life in the universe, regardless of how vile it seems to us, would we choose to do so?”

was replaced by:

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“This chapter proposed two strategies for eliminating teleonomic theories, theories that describe either our ultimate ends or what we need to achieve our ultimate ends. The “weak” strategy involves eliminating theories based on their correspondence to our perceptions of reality (empirical truth) and general completeness. The “strong” strategy also involves eliminating theories based on a specific criterion, the inclusion of a need for mystical oneness that we can satisfy by revering life. Both processes yield *descriptions*. Adding the *prescription* that we ought to fulfill our internal programs wisely (pursue happiness) changes these positive theories into normative ones.”

Also, the reference was changed from the second to the last paragraph to the last paragraph.

### **Chapter 4, last paragraph, last sentence**

“Whether we like it or not, we are all becoming entrepreneurs in the business of life.”

was replaced by:

“Whether we like it or not, **the information revolution is forcing us to become** entrepreneurs in the business of life.”

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## **Changes in Version 2000.07.08**

### **Preface, sixth paragraph, third sentence**

“Rather than founding a theory on a set of such assumptions, I propose ‘suspending’ a set of theories from a vague description of an ideal end.”

was replaced by:

“Rather than founding a theory on a set of such assumptions, I propose ‘suspending’ a set of theories from a vague description of an ideal **ultimate** end.”

### **Preface, seventh paragraph, first sentence**

“An immediate benefit of this ‘convergence’ strategy is that it provides us with a ‘strategic’ conceptual framework that can help us find the better ‘tactical’ problems to solve.”

was replaced by:

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“An immediate benefit of this ‘convergence’ strategy is that it provides us with a ‘strategic’ **world-view and related** conceptual framework (**Kuhnsian paradigm**) that can help us find the better ‘tactical’ problems to solve.”

### **Preface, eighth paragraph, first sentence**

“In keeping with Kuhn’s metaphor of conceptual frameworks as pictures...”

was replaced by:

“In keeping with Kuhn’s metaphor of **world-views and related** conceptual frameworks as pictures...”

### **Chapter 1, “Modern Economics’ Blind Spot,” second paragraph, last sentence**

“We can see this clearly in the economic order quantity (EOQ) model.”

was replaced by:

“We can see this clearly in the **marginalist** economic order quantity (EOQ) model.”

### **Chapter 1, “The Recursionist Approach,” fourth paragraph, fourth sentence**

“The first is a conceptual framework that helps us think clearly about our ultimate ends and the best means for achieving them.”

was replaced by:

“The first is a **world-view and related** conceptual framework that helps us think clearly about our ultimate ends and the best means for achieving them.”

### **Chapter 1, “The Recursionist Approach,” fourth paragraph, last sentence**

“Concepts, practical wisdom, trust, and liberty are critical factors in information age economies.”

was replaced by:

“**Vision (and related concepts)**, practical wisdom, trust, and liberty are critical factors in information age economies.”

### **Chapter 1, “Overview,” first paragraph, fourth sentence**

“Taken together, these three chapters provide a conceptual framework for thinking about the information age, a recursionist world-view.”

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was replaced by:

“Taken together, these three chapters provide a recursionist world-view, a pre-analytic vision for thinking clearly about information age economies.”

### **Chapter 2, “The Strategy for Choosing Economic Theories,” second paragraph, first sentence**

“Since the Keynesian revolution, economists have studied their subject on two levels, ‘microeconomics’ and ‘macroeconomics.’”

was replaced by:

“Since the Keynesian revolution, most economists have studied their subject on two levels, ‘microeconomics’ and ‘macroeconomics.’”

### **Chapter 2, “Science as a Process,” first paragraph, third sentence**

“To many that don’t believe this, it is merely an apology for current culture or the despoiling of the planet for the sake of producing ever more consumer goods.”

was replaced by:

“To many that don’t believe this, it is merely an apology for current culture or despoiling the planet for the sake of producing ever more consumer goods.”

### **Chapter 2, “Science as a Process,” first paragraph, last sentence**

“Whether it is the ability to read, write, calculate, operate a motor vehicle, use a computer, communicate clearly, think logically, or behave continently, useful knowledge does not recognize the boundaries that separate ‘consumption’ from ‘production’ and ‘trade.’”

was replaced by:

“Whether it is the ability to read, write, calculate, operate a motor vehicle, use a computer, learn quickly, communicate clearly, think logically, or behave continently, useful knowledge does not recognize the boundaries that separate ‘consumption’ from ‘production’ and ‘trade.’”

### **Chapter 2, “Summary,” last sentence**

“This explanation stands ready to be proven less useful than competing explanations in helping us find problems to solve.”

was replaced by:

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“This **loose** explanation, **this pre-analytic vision**, **will stand** ready to be proven less useful than competing explanations in helping us find problems to solve.”

### Chapter 4, “*Pleasure and Pain*,” last paragraph, last sentence

“We need practical knowledge of how to act wisely to pursue this virtuous circle.”

was replaced by:

“We need practical **wisdom**, knowledge of how to act wisely, to pursue this virtuous circle.”

### Chapter 4, “Profit”

The three paragraphs were simplified and combined into the following:

“Profit is the result of processing inputs into outputs well. From the marginalist perspective, entrepreneurs profit by managing their businesses efficiently. From the recursionist, all of us profit by deciding wisely. Because the money we save from not buying what we don’t need is just as useful to us as the money we receive from trading and producing wisely, the profits that we create by consuming wisely are just as real as those that we create by trading or producing wisely. In the words of Ben Franklin, ‘a penny saved is a penny earned.’ We are all entrepreneurs in the business of life.”

### Chapter 7, “Lucid Culture,” tenth paragraph, first sentence

“We are used to thinking about the moral hazards of insurance, people acting foolishly because they are protected by insurance.”

was replaced by:

“We are used to thinking about the moral hazards of insurance, people **choosing to act** foolishly because they are protected by insurance.”

### Chapter 8, second paragraph, third sentence

“It does this by providing us a conceptual framework for thinking about our ultimate ends and the best means to them.”

was replaced by:

“It does this by providing us a **world-view and related** conceptual framework for thinking about our ultimate ends and the best means to them.”

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## Changes in Version 2000.12.02

### American Foreword

Added a foreword directed to residents of the United States.

### Acknowledgments

Added the paragraph:

“Students of F. A. Hayek will recognize the homage I paid him in the dedication. Although I finished my first draft before reading any of his works, I probably owe more to this self-proclaimed member of “the party of life” than to any other economist. Some day I hope to honor him more fully with an essay titled *Why I Am Not A Libertarian*.”

### Chapter 1, title

“Introduction”

changed to:

“Strategic Assets”

### Throughout book

Changed “tool setting” to “tool-setting.”

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## Changes in Version 2001.09.17

### American Foreword, Afterword

The American Forward was dropped. Much of what it contained was moved to a new Afterword..

### Preface, second paragraph

Added the following sentences to the end of the paragraph:

“*We need an economics of knowledge*. Because wisdom is a form of knowledge, an adequate economics of knowledge must be based not on what *people will do*, but on what *the wise would do*. This is not only a radical departure from modern economics but also a radical departure from modern science.”

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## Preface, third paragraph, first sentence

“The source of this (reduction related) problem goes back to Adam Smith.”

changed to:

“The source of modern economics’ problem goes back to Adam Smith, the grandfather of modern economics.”

## Preface, last paragraph, last sentence

“Examples of such integrating, “strategic” theories include Darwin’s theory of evolution and Wegner’s theory of plate tectonics.”

changed to:

“Precedents for such a theory include Darwin’s theory of evolution and Wegner’s theory of plate tectonics. I believe that my unified theory ethics and economics is both positive and scientific.”

## Acknowledgments, first paragraph

Changed “critiquing” to “criticizing.”

## Acknowledgments, second paragraph, second sentence

“Although I finished my first draft before reading any of his works, I probably owe more to this self-proclaimed member of “the party of life” than to any other economist.”

changed to:

“Although I finished my first draft before reading any of his works, I owe more to this self-proclaimed member of “the party of life” than to any other economist.”

## Chapter 1, title

“Strategic Assets”

changed back to:

“Introduction”

## Chapter 1, “The Recursionist Approach,” third paragraph

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“Less important decisions ought to be made **by cheaper means**, by habit, standard procedure, or decision rules. The decision to employ these techniques for certain types of decisions is itself a decision, which often warrants formal deliberation.”

changed to:

“Less important decisions ought to be made by habit, standard procedure, or decision rules. The decision to employ these **cheaper means** for certain types of decisions is itself a decision, which often warrants formal deliberation.”

### Chapter 2, “*Products*,” last paragraph, last sentence

Dropped the footnote:

“The wiser we are in choosing our ultimate ends and the best means to them, the less we need theories for helping us find better problems to solve. If all of us were perfectly wise (‘angels’), we would need neither governments nor such theories.”

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## Changes in Version 2001.10.18

### Chapter 2, “*Products*,” fifth paragraph, second sentence

“The most obvious problem is how to improve **scheduling**.”

changed to:

“The most obvious problem is **determining** how to improve **sales volume predictions**.”

### Chapter 2, “The Strategy for Choosing Economic Explanations,” fifth paragraph, fourth sentence

“This definition is inconsistent with a complete decision-oriented approach to economics, which we need if we are to consider all (“ethical” as well as “economic”) knowledge resources.”

was deleted.

### Chapter 2, “Science as a Process,” third paragraph, last sentence

“Standards for the quality of knowledge are themselves beliefs subject to standards, which are beliefs subject to standards, and so on to infinity. As before, we can address this open-ended problem by changing our focus from state to process, specifically, from (the state of) the quality of knowledge to the process of knowing practical things about the world.”



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changed to:

“This is consistent with Einstein’s belief that the whole of science is nothing more than a refinement of everyday thinking:”

plus the two paragraph quote from Einstein’s 1936 *Franklin Institute* article, “Reality and Physics.”

### Chapter 2, last paragraph, last sentence

“This loose explanation, **this pre-analytic vision, will stand** ready to be proven less useful than competing explanations in helping us find problems to solve.”

changed to:

“ This loose explanation **stands** ready to be proven less useful than competing explanations in helping us find problems to solve.”

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## Changes in Version 2001.10.23

### Preface

Added the paragraph and quote:

“Futurists Alvin and Heidi Toffler see the failure of modern economic theories to consider knowledge adequately more of a missed opportunity than a threat. In a *Wall Street Journal* article dated October 13, 1994, they wrote:

‘The Republicans are basically right when they urge us to take maximum advantage of the dynamism and creativity that market economics make possible. But they, too, remain prisoners of Second Wave economics. For example, *even the free-market economists on whom Republicans rely have failed, as yet, to come to terms with the new role and inexhaustibility of knowledge.*’ (Emphasis added.)”

### Preface, third paragraph, last sentence

“This is not only a radical departure from modern economics but also a radical departure from **modern science.**”

changed to:

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“This is not only a radical departure from modern economics but also a radical departure from **what modern economists deem to be science.**”

### **Preface, eighth paragraph, second sentence**

Deleted: “(Kuhnsian paradigm).”

### **Preface, tenth paragraph, first sentence**

“At Toyota, manufacturing engineers play a different role than in traditional **batch** manufacturing.”

changed to:

“At Toyota, manufacturing engineers play a different role than in traditional manufacturing.”

### **Chapter 2, “*Products*,” third paragraph, last sentence**

“(Physicists currently seek better means of explaining, theories of what lies “beneath” or “behind” quantum mechanics, e.g., superstring theory, rather than better means of predicting what quantum mechanics predicts.)”

changed to:

“Physicists currently seek better means of explaining, theories of what lies “beneath” or “behind” quantum mechanics, e.g., superstring theory, rather than better means of predicting what quantum mechanics predicts.”

### **Chapter 2, “*Products*,” fourth paragraph, second and third sentences**

“**In decision tree analysis, predictions help us evaluate decision strategies and explanations help us formulate them. In more common terms,** predictions help us evaluate alternatives and explanations help us find them.”

changed to:

“**Predictions help us evaluate alternatives and explanations help us find them.**”

### **Chapter 4, “*Pursuing Happiness*,” first paragraph, last sentence**

“Not surprisingly, the world’s Alexanders prefer Aristotle’s ethics, while its Einsteins prefer Spinoza’s.”

moved to the end of the fourth paragraph.

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## Version 2001.10.30

### Chapter 1, paragraph six, last sentence

“The further we go into the information age with its ever-increasing potential for learning, the more costly this shortcoming becomes.”

changed to:

“**As we shall see**, the further we go into the information age with its ever-increasing potential for learning, the more costly this shortcoming becomes.”

### Chapter 2, “*Subjectivity*”, first paragraph, last sentence

“Because what we conceive depends on **who we are**, all theories are subjective.”

changed to:

“Because what we conceive depends on **the conceptual frameworks that we use to conceive the world**, all theories are subjective.”

### Afterword, first paragraph, fourth sentence

“When I discuss it with business and military leaders that topic is the importance of culture and strategic vision in ‘fast’ organizations.”

changed to:

“When I discuss it with business and military leaders that topic is the importance of culture and strategic vision in ‘fast’ organizations, **especially the need to improve OODA loop performance with strategic asset building loops**.”

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## Version 2001.11.06

### Acknowledgments, first paragraph

Changed Howard Sherman’s acknowledgment to reflect that he is no longer the Santa Fe Institute’s official unofficial philosopher. Added the acknowledgment to Gordon Douglass. Split the paragraph in two.

### Acknowledgments, second (now third) paragraph

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“Some day I hope to honor him more fully with an essay titled *Why I Am Not a Libertarian*.”

changed to:

“Some day I hope to honor him more fully with an essay titled *Why I Am Not a Libertarian* to compliment his essay, *Why I Am Not a Conservative*.”

### Chapters 3-7, endnotes 7-25 (web version only)

Corrected endnote reference mistake introduced in Version 10.10.18 with the insertion of the Einstein quote about science and everyday thinking.

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## Version 2001.11.11

### Preface, third paragraph, third sentence

“The act of creating knowledge adds an infinite element into economic calculations that changes tractable closed-ended economic models into **apparently** intractable open-ended ones.”

changed to:

“The act of creating knowledge adds an infinite element into economic calculations that changes tractable closed-ended economic models into **mathematically** intractable open-ended ones.”

### Chapter 1, second footnote, second sentence

“The economics profession has accepted dynamic computer models that involve **feedback mechanisms that affect** the fitness of economic agents, e.g., the ‘sugarscape’ models of Joshua Epstein and Robert Axtell (Brookings Institution).”

changed to:

“**Many economists have** already accepted dynamic computer models that involve the fitness of economic agents.”

### Chapter 1, “Modern Economics’ Blind Spot,” last paragraph, last sentence

Added the footnote:

“Applying a learning curve to a marginalist economic model is not new. Kenneth Arrow did it in his 1962 American Economic Review article, *The Implications of*

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*Learning by Doing.* There can be little doubt that the widespread failure to abandon the EOQ model for the rapid tool setting model for another two decades cost many tens of billions of dollars, perhaps more. What does this say about the relationship between economists and the people who use their products? How can economists get “closer” to their customers, the people who use their theories and the concepts derived from their theories? Finding a problem is like finding a diamond. Without a problem to solve, there can be no improvement.”

### Chapter 1, “Efficiency and Effectiveness,” first paragraph, first sentence

Added the sentence:

“In the EOQ model example above, the problem concerns the unstated assumption that the best means is the most ‘efficient’ means.”

### Chapter 1, “Efficiency and Effectiveness,” fourth paragraph, second sentence

“The **infinite renewability** of knowledge makes it impossible to know exactly how it will be used in the future, which makes it impossible to measure its value by measuring the value of the resources it replaces.”

changed to:

“The **inexhaustibility** of knowledge makes it impossible to know exactly how it will be used in the future, which makes it impossible to measure its value by measuring the value of the resources it replaces.”

### Chapter 4, “*Practical Wisdom*,” second paragraph, first sentence

“Like other forms of useful knowledge, practical wisdom is an **infinitely renewable** resource.”

changed to:

“Like other forms of useful knowledge, practical wisdom is an **inexhaustible** resource.”

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Version 2001.11.21

### Chapter 2, *Products*, fourth paragraph, last sentence

Added the footnote:

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“The meaning of ‘explanation of causation’ is problematic. The common sense approach taken here is to define it functionally. An explanation of causation is knowledge that helps us find problems to solve. Thus, the statement ‘Theories that explain causation help us find problems to solve.’ is true by definition.”

### **Chapter 2, Science as a Process, fourth paragraph, first sentence**

Dropped the footnote:

“When scientists (and others) appear to seek the truth per se, they are actually seeking to satisfy a spiritual need. The next chapter discusses this in greater detail.”

### **Chapter 2, Summary, second sentence**

“We can tighten this loose explanation by eliminating members of this set of theories and by learning more about complex adaptive systems.”

changed to:

“**Collectively**, we can tighten this loose explanation by eliminating members of this set of theories and by learning more about complex adaptive systems.”

### **Chapter 3, third footnote**

“Atheists may choose to substitute ‘nothingness’ for ‘infinite Being’ when thinking about magical mysticism and ‘being’ for ‘infinite Being’ when thinking about ethical mysticism.”

changed to:

“Those troubled by Schweitzer’s argument for the normative end of reverence for life, which is based on the existence of the need for ‘mystical oneness,’ can reach essentially the same conclusion by using Rawl’s argument.”

### **Chapter 4, throughout**

Eliminated quotation marks around several words, e.g., “misconception,” “fixed,” and “variable.”

### **Chapter 7, third paragraph, last sentence**

“This chapter considers several factors: moral vision, decentralization, lucid culture, and research.”

changed to:

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“This chapter considers several factors: moral vision, decentralization, just taxation, lucid culture, and research.”

## Chapter 7

Added the “Just Taxation” section.

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## Version 2001.11.26

### Preface, last paragraph, second sentence

“Whether my theory is positive depends on whether it describes the internal programs that motivate us.”

changed to:

“Whether recursionist economics is positive depends on whether it describes the internal programs that motivate us.”

### Preface, last paragraph, second sentence

“I believe that my unified theory of ethics and economics is both positive and scientific.”

changed to:

“I argue that recursionist economics is both positive and scientific.”

### Chapter 2, *The Strategy for Choosing Economic Explanations*, first paragraph, second sentence

Dropped the footnote:

“In complex adaptive systems such as economies, as (logical) time horizons lengthen, the value of accurate explanation rises relative to that of accurate prediction. We can think about this in terms of adaptation to a changing environment in which prediction concerns fitness to the environment at the beginning of the period (knowing how to solve our problems as we currently conceive them) and explanation concerns the ability to adapt to changing conditions (knowing how to find better problems to solve). As the time horizon increases, the value of adaptability (explanation) rises relative to the value of initial fitness (prediction).”

### Chapter 3, *Eliminating Simplistic Theories*, ninth paragraph, second sentence

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“Following its prescription, we are likely to do more harm than good.”

changed to:

“Pursuing it, we are likely to do more harm than good.”

### Chapter 7, *Consider Incentives and Enforcement Costs*, third paragraph, sixth sentence

Added the footnote:

“This can be as blatant as tyrants terrorizing their subjects in order to maintain power or as subtle as the head of a drug regulatory agency pursuing bureaucratic interests. By inventing reasons to reject drugs with significant “off-label” use and by excessively preferring Type 1 (rejecting what should be accepted) to Type 2 (accepting what should be rejected) errors, the myopic bureaucrat can silently slaughter on a scale surpassed only by history’s worst tyrants.”

### Afterword, first paragraph, last sentence

“With economists, it is how teleonomic theories can be both positive and normative, an arcane philosophical argument with the potential to open ethics to scientific inquiry.”

changed to:

“With economists, it is how teleonomic theories can be both positive and normative.”

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## Version 2002.01.26

### Acknowledgments

Reworked Sherman’s acknowledgment by adding material about pragmatism. Added Steve Brophy to the list.

### Preface, last paragraph, second sentence

“Whether recursionist economics is positive depends on whether it describes the internal programs that motivate us.”

was changed to:

“Whether my approach to economics is positive depends on whether it describes the internal programs that motivate us.”



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## Preface, last paragraph, last two sentences

“Precedents for such a theory include Darwin’s theory of evolution and Wegner’s theory of plate tectonics. I argue that recursionist economics is both positive and scientific.”

was changed to:

“Precedents for such an approach include Darwin’s theory of evolution and Wegner’s theory of plate tectonics. I argue that it is both positive and scientific.”

## Printed version, all chapters

Converted footnotes to endnotes. Combined Taiichi Ohno footnote and endnote into one endnote.

## Chapter 1, sixth footnote

Integrated the sixth footnote into the main text. Added a closing sentence:

“Our imperfect decision-making embeds pockets of ignorance into our culture and technology. The classic example is formation of a speculative bubble, where investors embed ignorance in the form of foolishly high asset valuations. A less recognized example is the establishment of an unhealthy, unsafe, or unjust tradition, which can endure long after members of the culture realize that it is foolish. We muddle forward not only by adapting to new knowledge but also by correcting past mistakes.”

## Chapter 1, seventh footnote

Dropped the footnote:

“The implicit model here is that of decision-making under uncertain conditions.”

## Chapter 2, fourth footnote

Dropped the last sentence:

“The minimum empirical standard for usefulness at helping us find problems to solve is empirical truth.”

## Chapter 5, *Good People*

Tightened up the introduction, body, and conclusion.

## Chapter 6, Progress versus Growth

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The example in paragraphs two and three was moved to the introduction and rewritten. Simplified remaining paragraph. Dropped second footnote.

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## Version 2002.02.18

### Preface

Removed quotation marks around ‘suspending,’ ‘convergence,’ ‘trick,’ ‘tactical,’ ‘strategic’ and ‘Just-In-Time Manufacturing’ in all paragraphs.

### Chapter 1, fifth paragraph, last sentence

“Adherents of this mathematical tour de force, which **neoclassical (mainstream marginalist)** economists call ‘general equilibrium theory,’ believe that it explains Smith’s ‘invisible hand.’”

was replaced by:

“Adherents of this mathematical tour de force, which economists call ‘general equilibrium theory,’ believe that it explains Smith’s ‘invisible hand.’”

### Chapter 1, first footnote (printed endnote 1)

“For simplicity, all future references to ‘scarce resources’ will refer to non-knowledge scarce resources.”

was replaced by the following text:

“For **both simplicity and to avoid debate over whether knowledge not yet in use is ‘scarce,’** all future references to ‘scarce resources’ will refer to non-knowledge scarce resources.”

### Chapter 1, third footnote (printed endnote 5)

“For decades, the EOQ model was taught in economics, engineering, and business school courses. It formed the core of the most advanced Western batch production control systems of the nineteen seventies and eighties (MRP systems). In recent years, the rapid tool-setting model, which is one of the pillars of Just-In-Time (JIT) manufacturing, has largely displaced it.”

was replaced by the following text:

“which is at the heart of Material Requirements Planning (MRP) systems, the most advanced Western production systems of the nineteen seventies and eighties.”

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## Chapter 1, fifth footnote (printed endnote 6)

“Note that the distinction between finding solutions to given problems and finding problems to solve is an arbitrary one in that we can break down any problem into smaller problems. If we are to distinguish between efficiency and effectiveness, we must be careful to distinguish between problems and smaller, subordinate problems. We must choose a scale. If we fail to do so, we will become hopelessly confused.”

was replaced by the following new paragraph:

“Before moving on, it is important to note that the distinction between efficiency and effectiveness varies with the scale of the problems we are discussing. The situation is essentially the same as distinguishing between tactics and strategy. Colonels deal with bigger problems than lieutenants. A problem that a colonel considers to be tactical a lieutenant may consider to be strategic. To make sure there is no misunderstanding, military officers use the mission to define the scale. Similarly, we must agree on a scale when distinguishing between efficiency and effectiveness. The scale of the recursionist approach outlined in this book is that of ‘microeconomics.’ Thus, the larger problems of ‘macroeconomics’ are strategic rather than tactical. As we shall see in later chapters, this has major implications for how we think about ‘macroeconomics.’”

Also, changed the lead sentence of the next paragraph,

“This concept of excellence in means recognizes that we can choose to invest scarce resources to obtain additional knowledge, which may lead us to choose a better problem to solve.”

to:

“This **managerial** concept of excellence in means recognizes that we can choose to invest scarce resources to obtain additional knowledge, which may lead us to choose a better problem to solve.”

## Chapter 1, Overview, sixth sentence

“The final two chapters discuss **what modern economists consider to be** ‘macroeconomic’ issues.”

was replaced by:

“The final two chapters discuss ‘macroeconomic’ issues.”

## Chapter 2, first footnote (printed endnote 7)

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“Here, ‘objectivity’ means the independence of the observer and the observed rather than the observer’s lack of interest in the results of the observation. The reason for this more stringent definition is that there is a recursive relationship between what we perceive and what we conceive. It is not simply that what we perceive influences how we conceive, but that what we conceive influences what we perceive. What we conceive influences what is “noise” to our senses. Our “perceptual filters” may eliminate “noise” without us being aware of it. Even the most disinterested observer may be biased.”

was replaced by the following new paragraph:

“Here, ‘objectivity’ means the independence of the observer and the observed rather than the observer’s lack of interest in the results of the observation. The reason for this more stringent definition is that there is a recursive relationship between what we perceive and what we conceive. It is not simply that what we perceive influences how we conceive, but that what we conceive influences what we perceive. What we conceive influences what is “noise” to our senses. Our senses may eliminate “noise” without us being aware of it. Even the most disinterested observer may be biased.\*”

plus the following endnote:

“\* A classic example of the recursive relationship between conception and perception is the way we learn to categorize phonetic sounds in the first few months of life. In learning how to listen to our native languages, we sacrifice some ability to differentiate between foreign sounds. For example, Japanese adults exposed to the English sounds ‘la’ and ‘ra’ as infants can perceive the difference between these sounds. Those not exposed have difficulty doing so.”

### **Chapter 2, fourth footnote (printed endnote 14)**

“An empirically true theory is one that corresponds to our sensations of reality. To be useful at helping us find problems to solve, philosophical theories must be empirically true.”

was replaced by the following new paragraph at the end of the section:

“Finally, note that the usefulness of this concept of science depends on our definition of usefulness. Useful for what? What is, or ought to be, the task at hand? What are our ultimate ends? The next chapter addresses these questions.”

### **Chapter 2, last paragraph, first sentence**

Removed quotation marks around ‘suspended,’ and ‘founded.’

### **Chapter 3, first footnote (printed endnote 16)**

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“Materialists may question why we should bother to reconcile materialism with dualism. The short answer is that dualist theories can be useful in pursuing our ultimate ends. The long one involves discussion of the limited usefulness of standards of theoretical beauty, e.g., Occam’s razor. Too much faith in these standards tends to make us accept theories that we ought to reject. On the other hand, too little tends to cause us to reject theories that we ought to accept, including some that are morally abhorrent, e.g., the racial theories of National Socialism. Understanding dualism helps us develop a generally acceptable rule for rejecting morally abhorrent theories, which lowers the negative consequences of accepting theories of ultimate ends based on their beauty. In short, adding an ethical test lowers the negative consequences of accepting “ugly” theories. Think of the process of buying fish. If we only judge fish by the way it looks, we are likely to reject more fish on the basis of how it looks than if we are able to judge it on both the way it looks and how it smells. Adding the process of judging fish by its smell lowers the negative consequences of accepting it by its looks.”

was inserted as a new paragraph.”

### **Chapter 3, second footnote (printed endnote 18)**

“In considering the reasonableness of Maslow’s theory, we must take care not to confuse what need actually causes a behavior with what need we usually associate with that behavior. For example, many venture capitalists favor companies founded by recently divorced entrepreneurs because they tend to throw themselves completely into their work. These venture capitalists hope to sell their stakes before the entrepreneurs burn themselves out. Recently divorced “workaholic” entrepreneurs try to satisfy their need for love with an activity that temporarily masks their need for love but which satisfies their need for esteem and self-actualization. The casual observer can easily confuse the need that we usually associate with building a company (esteem and self-actualization) with the entrepreneur’s actual need (love).”

was deleted.

### **Chapter 3, third footnote (printed endnote 20)**

“Those troubled by Schweitzer’s argument for the normative end of reverence for life, which is based on the existence of the need for “mystical oneness,” can reach essentially the same conclusion by using Rawl’s argument.”

was deleted.

### **Chapter 3, fourth footnote (printed endnote 26)**

“We see this manifest in ancient Hinduism’s failure to explain adequately how merit (karma), which concerns our relationship with the infinite Being, relates to worldly duty (dharma), which concerns our relationship with life. The result was a concept of

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justice in which people's roles in their society are fixed at birth. Clearly, this means of allocating labor is a tremendous hindrance to progress toward our ultimate ends."

was inserted as text.

### **Chapter 3, sixth footnote (printed endnote 29)**

"This recursive agreement between generations is similar in form and spirit to the Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants. The question is, how much sacrifice is enough?"

was deleted. The following sentence:

"The sixth and seventh chapters discuss this in greater detail."

was changed to:

"**This agreement between generations is similar in form and spirit to the Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants.** The sixth and seventh chapters discuss this in greater detail."

### **Chapter 3, *Reconciliation*, second paragraph, last sentence**

"Both materialists and dualists can agree **with Schweitzer's proposition that "all that is ethical goes back to a single principle of morality, namely the maintenance of life at its highest level, and the furtherance of life."**

was changed to:

"Both materialists and dualists can agree **on Schweitzer's normative end of reverence for life."**

### **Chapter 3, Summary**

"This chapter began by proposing a tautological definition of ultimate ends, which can accept a variety of teleonomic theories. Disagreement over metaphysical assumptions and the complexity of the subject makes it difficult to eliminate theoretical candidates. However, given that we are complex adaptive systems consisting of many elements, each seeking to satisfy its needs, we can eliminate many simplistic theoretical candidates. And given that our needs form a hierarchy and that we accept Schweitzer's emotional argument that at the top of this hierarchy is the need for "mystical oneness," we can eliminate unethical theories. What remains is a set of theories that deserve our tolerance. This tolerance is based on our ignorance of our ultimate ends and of the best means to them, rather than on the presumed right to do as we please."

was changed to:

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“This chapter proposed two means of eliminating teleonomic theories, theories that describe either our ultimate ends or what we need to achieve our ultimate ends. The weak one involves eliminating theories based on their correspondence to our perceptions of reality (empirical truth) and general completeness. The strong one also involves eliminating theories inconsistent with the normative end of reverence for life. What remains is a set of theories that deserve our tolerance. This tolerance is based on our ignorance of our ultimate ends and of the best means to them, rather than on the presumed right to do as we please.”

### Chapter 3, last footnote (printed endnote 31)

“This chapter proposed two strategies for eliminating teleonomic theories, theories that describe either our ultimate ends or what we need to achieve our ultimate ends. The “weak” strategy involves eliminating theories based on their correspondence to our perceptions of reality (empirical truth) and general completeness. The “strong” strategy also involves eliminating theories based on a specific criterion, the inclusion of a need for mystical oneness that we can satisfy by revering life. Both processes yield *descriptions*. Adding the *prescription* that we ought to fulfill our internal programs wisely (pursue happiness) changes these positive theories into normative ones.”

was changed to:

“Both **elimination** processes yield descriptions. Adding the prescription that we ought to fulfill our internal programs wisely, that is, pursue happiness, changes these positive theories into normative ones.”

### Chapter 5, first footnote (printed endnote 37)

“Unless otherwise noted, all future references to JIT manufacturing will refer to Toyota’s version.”

was inserted as text in parentheses.

### Chapter 6

Combined the old introduction and first section, Progress versus Growth, into a new introduction.

### Chapter 6, first footnote (printed endnote 41)

“Economists recognize two major technical problems in measuring what they measure. The first is having to measure means rather than ends when measuring services. According to such measurement, the value of a service is proportional to what we must pay for it. Thus, hiring a surgical team to remove a brain tumor for twenty thousand dollars is twice as productive as hiring the same team to do the same

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surgery for ten thousand dollars. The second problem is measuring the quality of goods and services, which involves making subjective assessments of value. For example, economists must assess how much more valuable surgery to remove a brain tumor performed today is than that performed twenty years ago. Attempting to measure economic progress broadens and deepens these two technical problems. Since all consumer goods and services are means to a good life rather than ends in themselves, the problem of measuring means rather than ends is universal. Worse, assessing the value of human action according to how well it satisfies our needs is more difficult than assessing the value of a good or service according to more concrete criteria.”

was incorporated into the new introduction.

### Chapter 7, introduction, first paragraph

“According to popular belief, the normative end of government is satisfying its citizens’ wants. Inevitably, the policies arising from attempts to satisfy these wants hinder progress toward our ultimate ends. Examples of such hindrance abound: agricultural set-asides and quotas that encourage the clearing of tropical rain forests for agricultural production, barriers to trade and corporate welfare programs that waste resources, employment regulations that keep people from working and keep those with jobs from moving to better ones, insurance laws that create moral hazards in the name of social justice, and tax policies that encourage imprudent behavior.”

was deleted.

### Chapter 7, introduction, second and third paragraphs

“From the recursionist perspective, the normative end of government is promoting progress by administering justice, which is a matter of **increasing** the quality of decision-making. To **improve the quality of decision-making**, governments must have a strategy **for deciding** who makes what decisions under what incentives.”

“There are those that aim at promoting progress and those that aim at preserving the status quo. At the beginning of the information age, the former are divided, with one group favoring a centralized approach to decision strategy and the other a decentralized one. The centralized approach involves giving officials the power to decide what is best for the rest of us. We might label this the “government of the future” strategy for its similarity to General Motors’ “factory of the future” program of the nineteen eighties. In contrast, the decentralized approach relies on average people making their own decisions, which corresponds to Toyota’s production system. Because the problem of promoting progress is even more amenable to decentralization than the problem of building cars, we can expect the latter, “learning” decision strategy to prevail. What constitutes a good “learning” strategy? This chapter considers several factors: moral vision, decentralization, just taxation, lucid culture, and research.”



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was changed to:

“From the recursionist perspective, the normative end of government is promoting progress by administering justice, which is a matter of **continuously improving** the quality of decision-making. **To do this well**, governments must have a “**learning strategy**” **that decides** who makes what decisions under what incentives. What constitutes a good learning strategy? This chapter considers several factors: moral vision, decentralization, just taxation, lucid culture, and research.”

### Chapter 7, first footnote (printed endnote 46)

“We tend to pursue a virtuous circle that increases the pace of change. We accumulate most of our wealth by substituting useful knowledge for scarce resources, which involves making changes to our means of living. As we change our means of living, we tend to accumulate capital that lowers the cost of change, e.g., information processing technology, trust, and practical wisdom. Lowering the cost of change allows us to change more quickly and easily. If we choose wisely, we realize this potential by choosing to accumulate more wealth, including more capital that lowers the cost of change.”

was deleted.

### Chapter 7, third footnote (printed endnote 48)

“**From the macroeconomic perspective, economies adapt to stress.** Monetary authorities have a role in producing an environment that is conducive to adaptation. The question is whether they should modify the stress of progress. Should economies adapt to the stress of progress or the stress of progress modified by monetary authorities? In the long run, who is better able to adapt to the stress of progress, economic agents or monetary authorities?”

was deleted. The two sentences preceding the footnote were changed from:

“**The wise choice for monetary authorities is** to choose the policy that increases the quality of decision-making most efficiently. When monetary authorities exercise discretion, they shift stress from one area of the economy to another and from the present to the future.”

to:

“**Monetary authorities ought** to choose the policy that increases the quality of decision-making most efficiently. When monetary authorities exercise discretion, they shift stress from one area of the economy to another and from the present to the future.”

### Chapter 7, *Consider Incentives and Enforcement Costs*, third paragraph, sixth sentence

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“Public officials have private agendas.”

was changed to:

“Public officials have private **and bureaucratic** agendas.”

### Chapter 7, Conclusion, first paragraph, first sentence

“Economist Thomas Sowell observes that those that view the world as being simple **(in that it has few trade-offs)** tend to support centralization and those that view it as complex **(in that it has many trade-offs)** tend to support decentralization.”

was changed to:

“Economist Thomas Sowell observes that those that view the world as being **relatively** simple tend to support centralization and those that view it as **relatively** complex tend to support decentralization.”

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## Version 2002.02.24

### Entire book

Removed double quotation marks around ‘microeconomics’ and ‘macroeconomics.’

### Preface, ninth paragraph

Added the following paragraph:

“Switching between two conceptual frameworks can be confusing. Words and phrases that have a particular meaning in one conceptual framework can have a different meaning, or no meaning at all, in the other. To make it easier for readers to understand my meaning, I’ve used the following conventions. When I use a term as a term, I enclose it in single quotation marks (‘’), and when I use a term to denote one of several meanings, I enclose it in double quotation marks (“”). Thus, ‘wealth’ is the term we use to define the end of economics and “wealth” is a particular definition of this term. Further, I italicize the first use of unfamiliar terms.”

### Chapter 1, second paragraph, last sentence

“Smith envisioned economies as systems, driven by people seeking to satisfy their wants and desires, **that organize themselves as if guided by an ‘invisible hand.’**”

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was replaced by:

“Smith envisioned economies as **self-organized** systems driven by people seeking to satisfy their wants and desires.”

### **Chapter 1, third paragraph**

Removed double quotation marks around ‘marginalist revolution’ and ‘shocked.’

### **Chapter 1, fifth paragraph, first sentence**

“Prior to 1935, most marginalist economists believed that **Smith’s ‘invisible hand’** would guide economies toward full employment.”

was changed to:

“Prior to 1935, most marginalist economists believed that **market forces** would guide economies toward full employment.”

### **Chapter 1, fifth paragraph, last sentences**

“Today, one group of Keynes’s followers, the Neo-Keynsians, believes that market forces tend toward full employment, but move too slowly. Another, the Post-Keynsians, believes that economies do not tend toward full employment. Both groups recommend that governments intervene in markets to maintain high employment and so promote economic growth and social stability.”

was deleted.

### **Chapter 1, sixth paragraph**

“In recent years, marginalist economists completed the work of Walrás by providing a complete and rigorous mathematical description of the conditions that cause an economic model to return to an equilibrium in which it is impossible to make one person better off without making another worse off.”

was combined with the fifth paragraph.

### **Chapter 1, sixth paragraph, last sentence**

“Adherents of this mathematical tour de force, which economists call general equilibrium theory, believe that it explains Smith’s ‘invisible hand.’”

was deleted.

### **Chapter 1, Efficiency and Effectiveness, first paragraph, second sentence**

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Removed double quotation marks around ‘managerial.’

## Chapter 1, Efficiency and Effectiveness, fourth paragraph, last sentence

Removed double quotation marks around ‘community.’

## Chapter 1, Efficiency and Effectiveness, sixth paragraph, first sentence

“Third, the end of economics must change, **which** is to say that the meaning of ‘wealth’ must change if it is to remain the term that we use to describe what we seek.”

was changed to:

“Third, the end of economics must change. **This** is to say that the meaning of ‘wealth’ must change if it is to remain the term that we use to describe what we seek.”

## Chapter 1, Efficiency and Effectiveness, sixth paragraph, second to the last sentence

“To think clearly about the latter, we need a concept of wealth that concerns what we *need* to achieve our ultimate ends.”

was changed to:

“To think clearly about the latter, we need a concept of wealth that concerns what we *need in order* to achieve our ultimate ends.”

## Chapter 1, The Recursionist Approach, first paragraph, fourth sentence

Replaced double quotation marks around ‘1’ with single quotation marks.

## Chapter 2, Subjectivity, second paragraph, fifth and sixth sentences

“**O**ur senses may eliminate ‘noise’ without us being aware of it. Further, our senses may eliminate ‘noise’ without us being aware of it.”

was changed to:

“**Further**, our senses may eliminate noise without us being aware of it. Further, our senses may eliminate noise without us being aware of it.”

## Chapter 2, Subjectivity, last paragraph, last sentence

“Because we are not always familiar with what is potentially most useful to us, we would be foolish to discard theories based on how **familiar they are, on their apparent objectivity.**”

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was changed to:

“Because we are not always familiar with what is potentially most useful to us, we would be foolish to discard theories based on how **objective they seem to us.**”

### **Chapter 2, *Products*, second paragraph, second sentence**

Replaced double quotation marks around ‘deterministic chaotic systems’ with italics.

### **Chapter 2, The Strategy for Choosing Economic Explanations, first paragraph, second sentence**

Removed double quotation marks around ‘long-term.’

### **Chapter 2, The Strategy for Choosing Economic Explanations, third paragraph, third sentence**

Changed “neoclassical” to “mainstream marginalist” in all.

### **Chapter 2, The Strategy for Choosing Economic Explanations, last paragraph, last sentence**

Removed double quotation marks around ‘core.’

### **Chapter 2, Science as a Process, last paragraph**

“Finally, note that the usefulness of this concept of science depends on our definition of usefulness.”

was changed to:

“Finally, note that the usefulness of this concept of science depends on our definition of ‘usefulness.’”

### **Chapter 3**

Removed double quotation marks around ‘socket,’ ‘selfish gene theory,’ ‘positive rights Postmodernism,’ and ‘naïve Trinitarianism.’ Replaced double quotation marks around ‘normative’ and ‘temporal’ with italics.

### **Chapter 3, Eliminating Simplistic Theories, fourth paragraph, last sentence**

“Further, many people find this version of altruism to be selfish, which itself is evidence that this theory is incomplete.”

was changed to:

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“Further, many people find this version of altruism to be selfish; which itself is evidence that this theory is incomplete.”

### Chapter 3, Eliminating Unethical Theories, second paragraph

“Materialists may question why we should bother to reconcile materialism with dualism. The short answer is that dualist theories can be useful in pursuing our ultimate ends. The long one involves discussion of the limited usefulness of standards of theoretical beauty, e.g., Occam’s razor. Too much faith in these standards tends to make us accept theories that we ought to reject. On the other hand, too little tends to cause us to reject theories that we ought to accept, including some that are morally abhorrent, e.g., the racial theories of National Socialism. Understanding dualism helps us develop a generally acceptable rule for rejecting morally abhorrent theories, which lowers the negative consequences of accepting theories of ultimate ends based on their beauty. In short, adding an ethical test lowers the negative consequences of accepting ‘ugly’ theories. Think of the process of buying fish. If we only judge fish by the way it looks, we are likely to reject more fish on the basis of how it looks than if we are able to judge it on both the way it looks and how it smells. Adding the process of judging fish by its smell lowers the negative consequences of accepting it by its looks.”

was changed to:

“Some philosophers and scientists may question the need to eliminate unethical theories, preferring instead to rely solely on eliminating theories based on standards of theoretical beauty, e.g., Occam’s razor. Think of the process of buying fish. If we only judge fish by the way it looks, we are likely to reject more fish on the basis of how it looks than if we are able to judge it on both the way it looks and how it smells. Adding the process of judging fish by its smell lowers the negative consequences of accepting it by its looks. Similarly, rejecting morally abhorrent theories lowers the negative consequences of accepting theories of ultimate ends based on their beauty.”

### Chapter 3, *Materialist Ultimate Ends*, first paragraph, third sentence

“Therefore, we can safely assume that our nature is fixed, which is the foundation of humanistic ethics.”

was changed to:

“We can safely assume that our nature is fixed. This is the foundation of humanistic ethics.”

### Chapter 4, first paragraph

“This chapter outlines a crude theory that holds true for all members of the set of teleonomic theories described in the last chapter. It provides us with a means of thinking about how we use knowledge and scarce resources to pursue happiness,

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which helps us find better problems to solve. **It** begins with an outline of excellence in consumption, which describes the pursuit of happiness. Next is an outline of excellence of trade, which emphasizes current misconceptions about trade, **and** excellence in production, which emphasizes the complex relationships between excellence in production, trade, and consumption. The chapter ends with a reminder that the focus of recursionist economics is on individuals rather than organizations.”

was changed to:

“This chapter outlines a crude theory that holds true for all members of the set of teleonomic theories described in the last chapter. **This strategic theory** provides us with a means of thinking about how we use knowledge and scarce resources to pursue happiness, which helps us find better problems to solve.

“**The chapter** begins with an outline of excellence in consumption, which describes the pursuit of happiness. Next is an outline of excellence of trade, which emphasizes current misconceptions about trade. **Following that is a brief discussion of** excellence in production, which emphasizes the complex relationships between excellence in production, trade, and consumption. The chapter ends with a reminder that the focus of recursionist economics is **on processes rather than states of the world and** on individuals rather than organizations.”

### Chapter 4, Excellence in Consumption, first paragraph, first three sentences

“Recursionist ethics differs markedly from utilitarianism, the ethical base of the **neoclassical** economics. From the utilitarian perspective, winning a fortune in the lottery will automatically lead to a good life, and so it is unequivocally good. From the **recursionist** view, it can be bad if the winner is foolish, as would be the case if the winner were an alcoholic that would use the money to pursue his or her self-destructive habit.”

was changed to:

“Recursionist **economics’ humanistic** ethics differs markedly from utilitarianism, the ethical base of the **marginalist** economics. From the utilitarian perspective, winning a fortune in the lottery will automatically lead to a good life, and so it is unequivocally good. From the **humanistic** view, it can be bad if the winner is foolish, as would be the case if the winner were an alcoholic that would use the money to pursue his or her self-destructive habit.”

### Chapter 4, *Pleasure and Pain*, third paragraph, first sentence

Double quotation marks changed to single quotation marks.

### Chapter 4, Excellence in Trade, second paragraph, last sentence

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Replaced double quotation marks around ‘fluid’ with italics.

### **Chapter 4, *The Effect of the Information Revolution*, first paragraph, sixth sentence**

Removed double quotation marks around ‘virtual.’

### **Chapter 5, *Efficiency Frontier*, first paragraph, first sentence**

Replaced double quotation marks around ‘efficiency frontier’ with italics.

### **Chapter 5, *Manufacturing Complexity*, first paragraph, second sentence**

Replaced double quotation marks around ‘production link’ with italics.

### **Chapter 5, *Batch Size*, last paragraph, first sentence**

Replaced double quotation marks around ‘batch production’ with italics.

### **Chapter 5, *Organization, Procedures, and Tools*, second paragraph, last sentence**

Replaced double quotation marks around ‘multimachine manning’ with italics.

### **Chapter 5, *Organization, Procedures, and Tools*, sixth paragraph, first two sentences**

Replaced double quotation marks around ‘autonomous,’ ‘automation with a human touch,’ and ‘autonomation’ with italics.

### **Chapter 5, *Organization, Procedures, and Tools*, eighth paragraph, second sentence**

Italicized ‘fool-proofing.’

### **Chapter 5, *Organization, Procedures, and Tools*, last paragraph, last sentence**

Replaced double quotation marks around ‘kaizen’ with italics.

### **Chapter 5, *Production Links*, last paragraph, last sentence**

Removed double quotation marks around ‘pull.’ Italicized ‘pull system.’

### **Chapter 5, *Knowledge Induction*, last paragraph**

Replaced double quotation marks around ‘five whys’ with italics. Replaced “why” with “Why?”

### **Chapter 5, *A Dynamic Perspective*, first paragraph, third from last sentence**



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Removed double quotation marks around ‘efficiency frontier.’

### Chapter 6, fourth paragraph

“There are two major technical problems in measuring aggregate production. The first concerns measuring the value of inputs rather than outputs when measuring services. According to this logic, hiring a surgical team to remove a brain tumor for twenty thousand dollars is twice as valuable as hiring the same team to do the same surgery for ten thousand dollars. The second concerns measuring changes in quality of goods and services. How much more valuable is the average personal computer manufactured today than one manufactured ten years ago? The potential for rapid learning exacerbates both problems. **Because** all consumer goods and services are means to a good life rather than ends in themselves, the problem of measuring means rather than ends is universal. Worse, assessing the value of human action according to how well it satisfies our needs is more difficult than assessing the value of a good or service according to more concrete criteria.”

was changed to:

“There are two major technical problems in measuring aggregate production. The first concerns measuring the value of inputs rather than outputs when measuring services. According to this logic, hiring a surgical team to remove a brain tumor for twenty thousand dollars is twice as valuable as hiring the same team to do the same surgery for ten thousand dollars. The second concerns measuring changes in quality of goods and services. How much more valuable is the average personal computer manufactured today than one manufactured ten years ago?

“**Whether economists choose to recognize it or not, the information revolution’s ever increasing** potential for rapid learning exacerbates both **of these measurement** problems. **All** consumer goods and services are means to a good life rather than ends in themselves. **Thus**, the problem of measuring **inputs rather than outputs** is universal. Worse, assessing the value of human action according to how well it satisfies our needs is more difficult than assessing the value of a good or service according to more concrete criteria.”

### Chapter 6, Increasing Excellence, third paragraph, third sentence

Removed double quotation marks around ‘shock.’

### Chapter 6, Economic Turbulence, third paragraph, second sentence

“Capturing the benefit of reducing turbulence **can** require trading with those hurt by it.”

was changed to:

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“Capturing the benefit of reducing turbulence **may** require trading with those hurt by it.”

### Chapter 6, Avalanche Catastrophes, first two paragraphs

“An economic “avalanche” catastrophe is a form of economic turbulence that involves the sudden **failure of a large segment of an economy due to the sudden** release of economic stress. **This stress may be something that has been building for decades, such as that which caused the collapse of the Soviet Union. It also may be something that has happened relatively quickly, such as that which caused the collapse of the word processing hardware industry, the fall of Wang, CPT, and others.**

“Because avalanches concern the release of **stored** stress, when adaptation is complete and immediate, no avalanches **can** occur. Fluid water dripping onto a flat surface will never cause an avalanche. In contrast, grains of sand do not completely and immediately adapt. Dropping grains on the same spot will create a “self-organized” sand pile. As each new grain falls on the spot, some previously fallen grains will shift their positions. Usually so few grains shift that the partial adaptation is almost imperceptible, but occasionally there is an avalanche. Because economies do not completely and immediately adapt, they too are subject to avalanches.”

was changed to:

“Economic avalanche catastrophes are **turbulent events** that involve the sudden release of economic stress. **Examples include the collapse of the Soviet Union and the ‘.com’ speculative bubble.** Because avalanches concern the release of stress, when adaptation is complete and immediate, no avalanches **will** occur. **Unlike grains of sand, ball bearings falling on a plane will never create an avalanche catastrophe.**”

### Chapter 6, Avalanche Catastrophes, third paragraph

Replaced double quotation marks around ‘self-organized criticality,’ ‘subcritical,’ and ‘supercritical’ with italics.

### Chapter 6, A Simple (Simplistic?) Model of Progress and Turbulence, first paragraph, last sentence

“We can imagine a free **market** economy consisting of people seeking happiness.”

was changed to:

“We can imagine a **freely evolving** economy consisting of people seeking happiness.”

### Chapter 7

Changed ““free market”” to “libertarian” in all.

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## **Chapter 7, first paragraph, fourth sentence**

“To do this well, governments must have a “learning strategy” **that decides** who makes what decisions under what incentives.”

was changed to:

“To do this well, governments must have a learning strategy **to help decide** who makes what decisions under what incentives.”

## **Chapter 7, Control the Money Supply Passively, second paragraph, fourth sentence**

Deleted “elevated.”

## **Chapter 7, Consider Incentives and Enforcement Costs, third paragraph, sixth sentence**

Deleted the endnote:

“This can be as blatant as tyrants terrorizing their subjects in order to maintain power or as subtle as the head of a drug regulatory agency pursuing bureaucratic interests. By inventing reasons to reject drugs with significant “off-label” use and by excessively preferring Type 1 (rejecting what should be accepted) to Type 2 (accepting what should be rejected) errors, the myopic bureaucrat can silently slaughter on a scale surpassed only by history’s worst tyrants.”

## **Chapter 7, Consider Incentives and Enforcement Costs, last paragraph, first sentence**

Removed double quotation marks around ‘cookbook.’

## **Chapter 7, Lucid Culture**

Dropped double quotation marks around ‘learning’ in the eighth paragraph and ‘break’ in the ninth.

## **Chapter 7, Research**

Dropped the Research section. Changed last line in introduction to reflect this change.

## **Chapter 8, first paragraph, last sentence**

“Over time, we can tighten this loose theory by eliminating members of this set and by discovering more about complex adaptive systems.”

was changed to:

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“Over time, we can tighten this loose theory by eliminating members of this set and by discovering more about **this** complex adaptive system.”

## Chapter 8, second paragraph, first sentence

“This **loose** theory differs markedly from current economic theories.”

was changed to:

“This loose **strategic** theory differs markedly from current (**tactical**) economic theories.”

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## Version 2002.03.04

## Preface, last paragraph, last sentence

Changed “it” to “my approach.”

## Chapter 1, The Recursionist Approach, third paragraph

“Our imperfect decision-making embeds pockets of ignorance into our **culture and technology**. The classic example is formation of a speculative bubble, **where investors** embed ignorance in the form of foolishly high asset valuations. A less recognized example is the establishment of an unhealthy, unsafe, or unjust tradition, which can endure long after members of the culture realize that it is foolish. We muddle forward not only by **adapting to new** knowledge but also by correcting past mistakes.”

was changed to:

“Our imperfect decision-making embeds pockets of ignorance into our **markets, technology, and culture**. The classic example is formation of a speculative bubble, **in which we** embed ignorance in the form of foolishly high asset valuations. **We also embed ignorance in the form of** unhealthy, unsafe, or unjust cultural traditions, which can endure long after **we recognize their foolishness**. We muddle forward not only by **creating** knowledge but also by correcting past mistakes.”

## Chapter 2, Science as a Process, sixth paragraph, third sentence

“A major characteristic of beautiful theories is their ability to explain much using few primary concepts and relations.”

was changed to:

“A major characteristic of beautiful theories is their ability to explain much **while** using few primary concepts and relations.”

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## Chapter 2, Science as a Process, last paragraph

“Finally, note that the usefulness of this concept of science depends on our definition of ‘usefulness.’ Useful for what? What is, or ought to be, the task at hand? What are our ultimate ends? The next chapter addresses these questions.”

was deleted.

## Chapter 2, Summary

“This chapter proposed a loose explanation of means suspended from a set of theories that define our ultimate ends, rather than founded on a set of metaphysical assumptions about human nature. Collectively, we can tighten this loose explanation by eliminating members of this set of theories and by learning more about complex adaptive systems. This loose explanation stands ready to be proven less useful than competing explanations in helping us find problems to solve.”

was changed to:

“This chapter proposed a loose explanation of means suspended from a set of ultimate ends. This explanation stands ready to be proven less useful than competing explanations in helping us find problems to solve. The next two chapters describe how we can tighten this loose theory of means to our ultimate ends.”

## Chapter 3, Eliminating Simplistic Theories, sixth paragraph, first three sentences

“The problem with this world-view is that we live in a material world. Because the essence of postmodernism is doubt about theories and belief systems, it cannot logically provide a theoretical framework to address practical problems that arise from the material world. This leaves only ad hoc solutions.”

was changed to:

“The problem with this world-view is that we live in a material world, not a world constructed entirely of our beliefs. We need a theoretical framework to address practical problems that arise from the material world.”

## Chapter 3, Dualist Worldly Ends, second paragraph, fourth sentence

Added the endnote:

“Adler, Mortimer, *Ten Philosophical Mistakes*, (New York, Collier Books, 1985), 137.”

## Chapter 3, third footnote

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Added:

“Because our internal programming includes programming to fulfill our programming, the statement that we ought to fulfill our programming (pursue happiness) is positive as well as normative. For more on this apparent contradiction of David Hume’s dictum as well as on the nature of happiness, read part two of Mortimer Adler’s book, *Ten Philosophical Mistakes*.”

### Chapter 5, second paragraph, second sentence

“As shown in the rapid tool-setting example, when the potential for learning is great, manufacturing excellence requires creating **of** knowledge **even** at the cost of lowering current ‘production.’”

was changed to:

“As shown in the rapid tool-setting example, when the potential for learning is great, manufacturing excellence requires creating knowledge at the cost of lowering current ‘production.’”

### Chapter 6, sixth paragraph, sixth and seventh sentences

“These include practical wisdom, trust, leisure skills, **and most production and trade technology**. Macroeconomic policies that aim at promoting growth **discourage** learning.”

was changed to:

“These include practical wisdom, trust, leisure skills, **trading methods, and much production technology**. Macroeconomic policies that aim at promoting growth **encourage growth at the expense of** learning.”

### Chapter 6, *Economic Fluidity*, sixth paragraph, second sentence

“The Italian clothing industry has showed the rest of the world how to use **recent advances in information processing and manufacturing** technology to respond **to changes in demand much more quickly**.”

was changed to:

“The Italian clothing industry has showed the rest of the world how to respond **much more quickly to changes in demand**.”

### Chapter 6, *Economic Fluidity*, seventh paragraph, fourth sentence

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“Successful decentralization requires that top management trusts others to choose wisely **and** that decision-makers trust their bosses to judge them on the quality of their decisions.”

was changed to:

“Successful decentralization requires that top management trusts others to choose wisely. **It also requires** that decision-makers trust their bosses to judge them on the quality of their decisions.”

### Chapter 6, Economic Turbulence, first paragraph, second sentence

“**Because we combine resources to produce other resources,** the turbulent flow of one resource tends to create turbulent flow of **other** resources.”

was changed to:

“**The** turbulent flow of one resource tends to create turbulent flow of **related** resources.”

### Chapter 6, Economic Turbulence, second paragraph, first sentence

“Poor decision-making creates turbulence in the flows **s** of resources.”

was changed to:

“Poor decision-making creates turbulence in the flow of resources.”

### Chapter 6, Economic Turbulence, second paragraph, last two sentences

“Similarly, if firms **facing a temporary rise in costs decide not to raise their products’ prices, progress occurs with a minimum of turbulence. But if they mistakenly believe the rise is permanent and raise their prices,** transient inflation will be more severe. Again, the worse the decision, the greater economic turbulence is likely to be.”

was changed to:

“Similarly, if firms **with published product prices foolishly raise their prices due to the mistaken belief that a temporary rise in input prices is permanent,** transient inflation will be more severe. Again, the worse the decision, the greater economic turbulence is likely to be.”

### Chapter 6, Avalanche Catastrophes, first paragraph

“Economic avalanche catastrophes are turbulent events that involve the sudden release of economic stress. Examples include the collapse of the Soviet Union and the **“.com”**

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speculative bubble. **Because avalanches concern the release of stored stress**, when adaptation is complete and immediate, no avalanches will occur. **Unlike grains of sand**, ball bearings falling on a plane will never create an avalanche catastrophe.”

was changed to:

“Economic avalanche catastrophes are turbulent events that involve the sudden release of **stored** economic stress. Examples include the collapse of the Soviet Union and the **dot.com** speculative bubble. **When** adjustment is complete and immediate, no avalanches will occur. **Ball bearings falling on a plane make complete and immediate adjustments and so will never create an avalanche.**”

### Chapter 7, first paragraph, first sentence

“From the recursionist perspective, the normative end of government is promoting progress by administering justice, which is a matter of continuously improving the quality of decision-making.”

was changed to:

“From the recursionist perspective **put forth in this work**, the normative end of government is promoting progress by administering justice, which is a matter of continuously improving the quality of decision-making.”

### Chapter 7, first paragraph, last sentence

“This chapter considers several factors: **moral vision, decentralization**, just taxation, and lucid culture.”

was changed to:

“This chapter considers several factors: **freedom, moral vision**, just taxation, and lucid culture.”

### Chapter 7, Moral Vision

Moved section to behind **Decentralization**.

### Chapter 7, Decentralization

Renamed the section to “**Freedom**.”

Moved *Control the Money Supply Passively* to the end of the section.

### Chapter 7, Freedom, first paragraph, first sentence



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“The following **outlines** three prescriptions for decentralizing decision-making, **which are familiar to libertarian economists.**”

was changed to:

“**The JIT example highlighted the benefits of decentralized decision-making.** The following **describes** three prescriptions for decentralizing decision-making.”

### **Chapter 7, *Consider Incentives and Enforcement Costs*, sixth paragraph, second sentence**

Removed the double quotation marks around ‘emergency.’

### **Chapter 7, *Control the Money Supply Passively*, first two paragraphs**

“From the recursionist perspective, the purpose of economic policy is to improve the quality of decision-making.”

“When people decide wisely, they relieve economic stress. They also tend to learn through experience. Those who focus on the former view the task of monetary authorities as being similar to that of ski patrols in preventing major avalanches and forest rangers in preventing major forest fires. The goal is to prevent the accumulation of potential energy (snow mass on mountains and tinder in forests). This occasionally requires initiating events that release potential energy (avalanches and forest fires). Similarly, monetary authorities occasionally may need to initiate minor recessions in order to prevent major ones. Such thinking ignores the potential benefit of learning through experience.”

were deleted.

### **Chapter 7, *Moral Vision*, first paragraph**

“Successful **decision-making in any organization** requires a means of coordinating decisions. **In decentralized organizations, such coordination** requires a common vision. Only a foolish manager delegates decision-making authority without first explaining what is expected of subordinates. Similarly, only a foolish government decentralizes decision-making authority without explaining what is expected of its citizens. **If a government is just, its function is to help its citizens pursue happiness. The first and foremost action of a just government should be to provide** a moral vision of how to pursue happiness in an **open (freely evolving)** society.”

was changed to:

“Successful **decentralization** requires a common vision. Only a foolish manager delegates decision-making authority without first explaining what is expected of subordinates. Similarly, only a foolish government decentralizes decision-making

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authority without explaining what is expected of its citizens. A just government provides its citizens with a moral vision of how to pursue happiness in a freely **progressing** society.”

### Chapter 7, Moral Vision, last paragraph, last sentence

“In **a rapidly changing world**, what matters most is not values and behaviors, but vision and concepts.”

was changed to:

“In **information age economies**, what matters most is not values and behaviors, but vision and concepts.”

### Chapter 7, Just Taxation, last paragraph, last sentence

“High on this list are income taxes, which discourage **using** knowledge and taking risks.”

was changed to:

“High on this list are income taxes, which discourage **acquiring** knowledge and taking risks.”

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## Version 2002.03.09

### Printed version

Converted explanatory endnotes back to footnotes.

### Preface, eleventh paragraph, second sentence

“At Toyota, manufacturing engineers play a different role than in traditional manufacturing.”

was changed to:

“At Toyota, manufacturing engineers play a different role than **they do** in traditional manufacturing.”

### Chapter 1, The Recursionist Approach, third paragraph, fourth sentence

Inserted the sentence:

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“Skin tanning, body piercing, sumo wrestling, slavery, and countless forms of conspicuous consumption spring to mind.”

### **Chapter 1, The Recursionist Approach, fourth paragraph, first sentence**

“Formal decision-making processes consist of four basic operations: (1) finding a problem to solve, (2) identifying alternative solutions to the chosen problem, (3) selecting an alternative, and (4) implementing the selected alternative.”

was changed to:

“**Decision scientists tell us that** formal decision-making processes consist of four basic operations: (1) finding a problem to solve, (2) identifying alternative solutions to the chosen problem, (3) selecting an alternative, and (4) implementing the selected alternative.”

### **Chapter 2, Subjectivity, second paragraph**

“Here, ‘objectivity’ means the independence of the observer and the observed rather than the observer’s lack of interest in the results of the observation. The reason for this more stringent definition is that there is a recursive relationship between what we perceive and what we conceive. It is not simply that what we perceive influences how we conceive, but that what we conceive influences what we perceive. What we conceive influences what is noise to our senses. Further, our senses may eliminate noise without us being aware of it. Even the most disinterested observer may be biased.”

was deleted.

### **Chapter 2, Subjectivity, first paragraph, last sentence, footnote**

“A classic example of the recursive relationship between conception and perception is the way we learn to categorize phonetic sounds in the first few months of life. In learning how to listen to our native languages, we sacrifice some ability to differentiate between foreign sounds. For example, Japanese adults exposed to the English sounds ‘la’ and ‘ra’ as infants can perceive the difference between these sounds. Those not exposed have difficulty doing so.”

was changed to:

“**Here, ‘objectivity’ means the independence of the observer and the observed rather than the observer’s lack of interest in the results of the observation. The reason for this more stringent definition is that there is a recursive relationship between what we perceive and what we conceive. It is not simply that what we perceive influences how we conceive, but that what we conceive influences what we perceive.** A classic example of the recursive relationship between conception and perception is the way

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we learn to categorize phonetic sounds in the first few months of life. In learning how to listen to our native languages, we sacrifice some ability to differentiate between foreign sounds. For example, Japanese adults exposed to the English sounds ‘la’ and ‘ra’ as infants can perceive the difference between these sounds. Those not exposed have difficulty doing so. **Even the most disinterested observer may be biased.**”

### **Chapter 2, The Strategy for Choosing Economic Explanations, third paragraph, first sentence**

“The obvious candidate to explain economies is modern Austrian economics, which seeks to explain human action. ”

was changed to:

“One small but increasingly influential group of marginalist economists, the modern Austrian school, seeks to explain what happens in economies.”

### **Chapter 2, The Strategy for Choosing Economic Explanations, last paragraph, last sentence**

“Applying the modern Austrian school’s deductive method to the question of how we turn consumer goods into progress toward our ultimate ends appears to require making controversial metaphysical (**unverifiable fundamental**) assumptions about human nature. The most important of these concerns whether an immaterial part of us survives the death of our bodies.”

was changed to:

“Applying the modern Austrian school’s deductive method to the question of how we turn consumer goods into progress toward our ultimate ends appears to require making controversial metaphysical assumptions about human nature. The most important of these **unverifiable fundamental assumptions** concerns whether an immaterial part of us survives the death of our bodies.”

### **Chapter 2, The Strategy for Choosing Economic Explanations, last paragraph, last sentence**

“As we learn more, we can eliminate members of this set **of theories** without having to change our core theory of means.”

was changed to:

“As we learn more, we can eliminate members of this set without having to change our core theory of means.”

### **Chapter 2, Summary**

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“This chapter proposed a **loose explanation** of means suspended from a set of ultimate ends. This explanation stands ready to be proven less useful than competing explanations in helping us find problems to solve. **The next two chapters describe how we can tighten this loose theory of means to our ultimate ends.**”

was changed to:

“This chapter proposed a **strategy for progress, which involves defining and gradually tightening a loose theory of means to our ultimate ends. This loose theory of means consists of a core theory** of means suspended from a set of ultimate ends. This explanation stands ready to be proved less useful than competing explanations in helping us find better problems to solve.”

### Chapter 3, first three paragraphs

“The previous chapter proposed a loose theory of means suspended from a set of ultimate ends. We can tighten this loose theory by eliminating members of this set. The major difficulty in doing so is agreeing on metaphysical assumptions about human nature. The most important such assumption concerns whether our minds and bodies are separate and distinct. The *materialist* view is that they are not, which is to say that all of our elements die when our bodies die. The *dualist* view is that they are, which allows the possibility that a part or parts of us survive the deaths of our bodies. This possibility casts doubt on the materialist truism that the ultimate end of life is a good life.

“We can avoid most of the metaphysical problems associated with this recursionist approach to economics by defining ultimate ends tautologically: our ultimate ends are the ends that we achieve when we satisfy our needs and our needs are those things that we need to achieve our ultimate ends. By itself, this tautology is useless as well as meaningless. However, it can act as a socket for accepting theories that define either our ultimate ends or what we need to achieve them. This driver / tool head approach isolates the core “economic” theory (the driver) from the “ethical” theories used to define ultimate ends (the tool heads). If one “ethical” theory proves to be false or inadequate, we can choose another without revising the “economic” theory. This allows us to make the problem of defining our ultimate ends part of the problem that we must solve.

“Although this socket works with most theories that aim at explaining our ultimate ends or needs, it does not work with all of them. As we shall see in the next chapter, recursionist economics assumes that we are motivated to satisfy our needs. All *teleonomic* theories, theories that look to an internal program or programs to explain our ends, pass this test.”

was changed to:

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“The previous chapter proposed a loose theory of means consisting of a core theory of means suspended from a set of ultimate ends. We can tighten this loose theory by tightening the core theory of means. We can also tighten it by eliminating members from the set of ultimate ends. We do so by eliminating members of the set of all *teleonomic* theories.” This chapter proposes means of eliminating simplistic and unethical theories from this set of theories.

“Some philosophers and scientists may question the need to eliminate unethical theories. They need to think about the process of buying fish. If we only judge fish by the way it looks, we are likely to reject more fish on the basis of how it looks than if we are able to judge it on both the way it looks and how it smells. Adding the process of judging fish by its smell lowers the negative consequences of accepting it by its looks. Similarly, rejecting unethical theories lowers the negative consequences of accepting teleonomic theories based on their theoretical beauty.”

Plus the footnote:

“For this strategy to work, the core theory of means and the theories that define ultimate ends must both fit together and work together. We can insure that the theories fit together by defining our ultimate ends and the means to them tautologically: *our ultimate ends are the ends that we achieve when we satisfy our needs and our needs are those things that we need to achieve our ultimate ends*. We can insure they work together by assuming that we are motivated to achieve our ultimate ends. All *teleonomic theories*, theories that look to an internal program or programs to explain our ultimate ends, meet these conditions.”

### Chapter 3, Eliminating Simplistic Theories, first paragraph, first sentence

“We can begin **reducing the number of theoretical candidates for the set of** teleonomic theories that define ultimate ends by eliminating misleadingly incomplete **models of human nature**.”

was changed to:

“Beautiful theories are simple without being too simple. We can begin eliminating teleonomic theories by eliminating **simplistic ones**.”

### Chapter 3, Eliminating Simplistic Theories, first paragraph, fifth sentence

Added the sentence:

“They too often fail to help us find the most effective problem to solve.”

### Chapter 3, Eliminating Simplistic Theories, last paragraph, second sentence

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“However, to be included in the set of theories that explain our needs we must explain not only altruism but also a (usefully) complete range of human motivations.”

was changed to:

“However, it fails to consider a usefully complete range of human motivations and so too often fails to find the most effective problem to solve.”

### Chapter 3, Eliminating Unethical Theories, first two paragraphs

“If we can agree on what our highest ethical end is, then we have another means of eliminating **theoretical candidates**. **A major reason that such agreement is difficult is that dualists believe in otherworldly ends and materialists do not.** The following explores the materialist view of the good life, goes on to explore dualist worldly ends, and finishes by reconciling the materialist and dualist views. If we accept this pragmatic reconciliation, then we will have another means of **eliminating theoretical candidates.**”

“Some philosophers and scientists may question the need to eliminate unethical theories, preferring instead to rely solely on eliminating theories based on standards of theoretical beauty, e.g., Occam’s razor. Think of the process of buying fish. If we only judge fish by the way it looks, we are likely to reject more fish on the basis of how it looks than if we are able to judge it on both the way it looks and how it smells. Adding the process of judging fish by its smell lowers the negative consequences of accepting it by its looks. Similarly, rejecting morally abhorrent theories lowers the negative consequences of accepting theories of ultimate ends based on their beauty.”

was changed to:

“If we can agree on what our highest ethical end is, then we have another means of eliminating **teleonomic theories**. The major difficulty in doing so is agreeing on metaphysical assumptions about human nature. **The most important such assumption concerns whether our minds and bodies are separate and distinct. The *materialist* view is that they are not, which is to say that all of our elements die when our bodies die. The *dualist* view is that they are, which allows the possibility that a part or parts of us survive the deaths of our bodies. This possibility casts doubt on the materialist truism that the ultimate end of life is a good life.**

“The following explores the materialist view of the good life, goes on to explore dualist worldly ends, and finishes by reconciling the materialist and dualist views. If we accept this pragmatic reconciliation, then we will have another means of **tightening our loose theory of means.**”

### Chapter 3, Summary, first paragraph

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“This chapter proposed two means of eliminating teleonomic theories, theories that describe either our ultimate ends or what we need to achieve our ultimate ends. The weak one involves eliminating theories based on their correspondence to our perceptions of reality (empirical truth) and general completeness. The strong one also involves eliminating theories inconsistent with the normative end of reverence for life.\*\*\*\* What remains is a set of theories that deserve our tolerance. This tolerance is based on our ignorance of our ultimate ends and of the best means to them, rather than on the presumed right to do as we please.”

was changed to:

“This chapter proposed two means of eliminating teleonomic theories. The first involves eliminating theories based on their correspondence to our perceptions of reality and general completeness. The second involves eliminating theories inconsistent with the normative end of reverence for life.\*\*\*\* What remains is a set of theories that deserve our tolerance. This tolerance is based on our ignorance of our ultimate ends and of the best means to them, rather than on the presumed right to do as we please.”

### Chapter 4, first two paragraphs

“This chapter outlines a crude theory that holds true for all members of the set of teleonomic theories described in the last chapter. This strategic theory provides us with a means of thinking about how we use knowledge and scarce resources to pursue happiness, which helps us find better problems to solve.

“The chapter begins with an outline of excellence in consumption, which describes the pursuit of happiness. Next is an outline of excellence of trade, which emphasizes current misconceptions about trade. Following that is a brief discussion of excellence in production, which emphasizes the complex relationships between excellence in production, trade, and consumption. The chapter ends with a reminder that the focus of recursionist economics is on processes rather than states of the world and on individuals rather than organizations.”

was changed to:

“This chapter outlines the core theory of means. It begins with an outline of excellence in consumption, which describes the pursuit of happiness. Next is an outline of excellence of trade, which emphasizes current misconceptions about trade. Following that is a brief discussion of excellence in production, which emphasizes the complex relationships between excellence in production, trade, and consumption. The chapter ends with a reminder that the focus of recursionist economics is on processes rather than states of the world and on individuals rather than organizations.”

### Chapter 8, first paragraph, second sentence



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“To **think clearly about these interactions**, we need a loose theory of means **that is based on** a set of ultimate ends. Over time, we can tighten this loose theory by **eliminating members of this set and by** discovering more about **this complex adaptive system**.”

was changed to:

“To **progress readily**, we need a loose theory of means **suspended from** a set of ultimate ends. Over time, we can tighten this loose theory by discovering more about **our ultimate ends and the best means to them**.”

### Afterword

Removed double quotation marks around ‘strategic,’ ‘tactical,’ ‘nanny state,’ and ‘radical center.’

### Afterword, second to last paragraph, last sentence.

Removed ‘true’ in front of ‘conservative’ and ‘libertarian.’

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## Version 2002.03.12

### Reorganization

Changed **Just In Time Manufacturing** from chapter 5 to chapter 2. Changed Chapter 1’s Overview to reflect this change. Also inserted an **Overview** section to Chapter 2 by moving three paragraphs, save the last sentence in the third paragraph, from Chapter 4’s *Three Misconceptions* subsection.

### Preface, eighth paragraph

“In keeping with Kuhn’s metaphor of world-views and related conceptual frameworks as pictures, I have drawn a Chinese landscape — an outline of major features with just enough detail to make them recognizable. My hope is that this minimalist approach will make it easier for readers to recognize the unfamiliar scene and that subsequent viewings will allow them to fill in the expanses with images from their own experiences. My primary objective is to provide a means for producing insights into the business of life rather than the insights themselves.”

was deleted.

### Chapter 1, Overview, first paragraph, second sentence

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“To **think clearly about these interactions**, we need a loose theory of means **that is based on** a set of ultimate ends. Over time, we can tighten this loose theory by **eliminating members of this set and by** discovering more about **this complex adaptive system**.”

was changed to:

“To **progress readily**, we need a loose theory of means **suspended from** a set of ultimate ends. Over time, we can tighten this loose theory by discovering more about **our ultimate ends and the best means to them**.”

### **Chapter 2, A Dynamic Perspective, last paragraph, last sentence**

Added the sentence:

“They thrived by learning wisely.”

### **Chapter 3, first paragraph, first three sentences**

“Every waking moment offers us the opportunity to change the course of our lives for the better. The process of changing our lives for the better begins with finding a problem to solve. This chapter proposes a strategy for selecting theories to help us find more effective problems to solve.”

was changed to:

“Toyota’s strategy for learning to manufacture ever more wisely involves slowly tightening a loose production system. This chapter outlines a strategy for learning to live ever more wisely, which involves slowly tightening a loose theory of means to our ultimate ends.”

### **Chapter 4, second paragraph**

“ Some philosophers and scientists may question the need to eliminate unethical theories. They need to think about the process of buying fish. If we only judge fish by the way it looks, we are likely to reject more fish on the basis of how it looks than if we are able to judge it on both the way it looks and how it smells. Adding the process of judging fish by its smell lowers the negative consequences of accepting it by its looks. Similarly, adding the process of judging theories on ethical grounds lowers the negative consequences of accepting them for their beauty.”

was deleted.

### **Chapter 4, Eliminating Simplistic Theories, first paragraph, first sentence**

“Beautiful theories are simple **without being** too simple.”

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was changed to:

“Beautiful theories are simple **but not** too simple.”

## Chapter 4, Eliminating Simplistic Theories, tenth paragraph, last sentence

“**The classic** example of this harmful form of charity is giving money to **an alcoholic** who has not yet committed to stop **drinking**.”

was changed to:

“**A good** example of this harmful form of charity is giving money to an **addict** who has not yet committed to stop **using drugs**.”

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## Version 2002.03.14

### Preface, first paragraph, last two sentences

“**His prescription is for us to develop** a conceptual framework that recognizes our fallibility. **A conceptual framework that** explicitly recognizes the scarcity of knowledge as well as non-knowledge resources **would fill this prescription**.”

was changed to:

“**He calls for** a conceptual framework that recognizes our fallibility. **In economic terms, he calls for** explicitly recognizing the scarcity of knowledge as well as non-knowledge resources.”

### Preface, sixth paragraph, fifth and sixth sentences

Started new paragraph. Changed:

“I see **our** problem as one of progressing toward our ultimate ends *and of learning how to progress toward our ultimate ends ever more efficiently*. I also envision a means for all of us, working together, to solve this problem.”

to:

“I see **intelligent beings’ ethical/economic/political** problem as one of progressing toward our ultimate ends *and of learning how to progress toward our ultimate ends ever more efficiently*. I also envision a means for all of us, working together, to solve this problem.”

### Preface, eighth paragraph, first sentence

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“Traditional theories of ethics, politics, and economics ultimately rest on a set of **metaphysical** (unverifiable fundamental) assumptions about human nature.”

was changed to:

“Traditional theories of ethics, politics, and economics ultimately rest on a set of unverifiable fundamental assumptions about human nature.”

### Preface, second to last paragraph, last two sentences

“In this most cited economics paper, Friedman advocates (what Whitehead would call) “simple-minded” theories that predict **what will happen in economies**. I advocate a simple-minded **strategic** theory that explains causation **to** compliment tactical theories that predict.”

was changed to:

“In this most cited economics paper, Friedman advocates what Whitehead would call “simple-minded” theories that predict. **Theories that predict help us solve given problems**. I advocate a simple-minded theory that explains causation. **Theories that explain causation help us find better problems to solve. My *strategic* theory that explains what happens in economies compliments *tactical* theories that predict **what will happen in markets**.**”

### Chapter 1, first paragraph

Started new paragraph between fifth and sixth sentences. Changed eighth sentence:

“For example, once a railroad company has laid its track, changing **to a superior** distance between rails is very expensive.”

to:

“For example, once a railroad company has laid its track, changing the distance between rails is very expensive. **Rarely does the benefit of changing this distance warrant doing so.**”

### Chapter 1, (old) second paragraph, last sentence

“For Smith, ‘wealth’ meant consumer goods and the resources for producing consumer goods, where consumer goods are those goods and services that we buy to satisfy our wants and desires.”

to:

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“For Smith, **the end of economics was the consumption of goods and services that we buy to satisfy our wants and desires. Thus,** ‘wealth’ meant consumer goods and the resources for producing consumer goods.”

### Chapter 1, (old) fourth paragraph, second and third sentences

“In that year, John Maynard Keynes published his *General Theory of Employment, Interest, and Money*, which argued that flaws in the way that markets work could or would lead to long-term unemployment. **In recent years, marginalist economists completed the work of Walrás by providing a complete and rigorous mathematical description of the conditions that cause an economic model to return to an equilibrium in which it is impossible to make one person better off without making another worse off.**”

to:

“In that year, John Maynard Keynes published his *General Theory of Employment, Interest, and Money*, which argued that flaws in the way that markets work **either** could or would lead to long-term unemployment. **Keynes’s theory effectively split the discipline in to macroeconomics, the study of entire economies, and microeconomics, the study of individual firms, households, and consumers.**”

### Chapter 1, Marginalist Economics’ Blind Spot, third paragraph, last sentence

“This quantity maximizes the net benefit of holding inventory *for our current knowledge of how to set up.*”

was changed to:

“ This quantity maximizes the net benefit of holding inventory *for our current knowledge of how to set up **tools.***”

### Chapter 1, Marginalist Economics’ Blind Spot, last paragraph, fourth sentence

“Competitors that” was changed to: “competitors who.”

### Chapter 1, Efficiency and Effectiveness, second paragraph, last two sentences

“Thus, the larger problems of macroeconomics are strategic rather than tactical. As we shall see in later chapters, this has major implications for how we think about macroeconomics.”

was deleted.

### Chapter 1, Overview, fourth sentence

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“The fourth takes a muddle-headed (inclusive) look at our ultimate ends and the fifth takes a simple-minded (discriminating) look at the means to them.”

was changed to:

“The fourth takes an inclusive (‘muddle-headed’) look at our ultimate ends and the fifth takes a discriminating (‘simple-minded’) look at the means to them.”

### Chapter 3, *Subjectivity*, first paragraph

“Theories are conceptual models of sensory experience. Concepts are tools that focus our attention on certain characteristics of objects by ignoring other characteristics. We can conceive of the world in many ways. Because concepts do not capture fully what we can perceive, what we conceive depends on the concepts that we use to describe what we perceive. Because what we conceive depends on the conceptual frameworks that we use to conceive the world, all theories are subjective.”

was changed to:

“Concepts are tools that focus our attention on certain characteristics of objects by ignoring other characteristics. We can conceive of the world in many ways. What we conceive depends on the concepts that we use to describe what we perceive. Because what we conceive depends on the concepts we use, all conceptual models, which is to say all theories, are subjective.”

### Chapter 3, *The Strategy for Choosing Economic Explanations*, first paragraph

“All of us need a theory that explains to help us decide what to want. This is particularly true for those of us living in knowledge-based economies, where the pace of change often makes the long-term a matter of months rather than years. Developing such a theory involves choosing a level of abstraction, which is a matter of finding objects that we can predict or explain. We can study subjects on more than one such level. For example, we can study matter and energy on a subatomic scale with quantum mechanics, a molecular scale with chemistry, a human scale with Newtonian dynamics, or a cosmic scale with relativity theory. Which of these is best depends on what we are trying to do.”

was changed to:

“All of us need to decide what to want. Theories that explain causation can help us decide wisely. Developing theories involves choosing a level of abstraction, which is a matter of finding objects that we can predict or explain. We can study subjects on more than one such level. For example, we can study matter and energy on a subatomic scale with quantum mechanics, a molecular scale with chemistry, a human scale with Newtonian dynamics, or a cosmic scale with relativity theory. Which scale is best depends on what we are trying to do.”

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## Chapter 3, Science as a Process, first paragraph, second sentence

“To those that” was changed to: “to those who.”

## Chapter 3, Science as a Process, first paragraph, third sentence

“To many that” was changed to: “to many who.”

## Chapter 3, Science as a Process, second paragraph, first sentence

“Those that” was changed to: “those who.”

## Chapter 3, Science as a Process, third paragraph, second sentence

“First, it aims at discovering what is useful rather than the truth per se.”

was changed to:

“First, rather than aiming at discovering the truth per se, it aims at discovering the useful.”

## Chapter 3, Science as a Process, third paragraph

“The proposed **concept of science is much more modest than this. First, rather than aiming at discovering the truth per se, it aims at discovering the useful. Second, it focuses on the process of knowing rather than on the quality of knowledge produced. This is consistent with Einstein’s belief that ‘the whole of science is nothing more than a refinement of everyday thinking:’**

“It has often been said, and certainly not without justification, that the man of science is a poor philosopher. Why, then, should it not be the right thing for the physicist to let the philosopher do the philosophizing? Such might indeed be the right thing at a time when the physicist believes he has at his disposal a rigid system of fundamental concepts and fundamental laws which are so well established that waves of doubt cannot reach them; but, it cannot be right at a time when the very foundations of physics itself have become problematic as they are now. At a time like the present, when experience forces us to seek a newer and more solid foundation, the physicist cannot simply surrender to the philosopher the critical contemplation of the theoretical foundations; for, he himself knows best, and feels more surely where the shoe pinches. In looking for a new foundation, he must try to make clear in his own mind just how far the concepts which he uses are justified, and are necessities.”

was changed to:

“The proposed **strategy** refines everyday thinking. This is consistent with Einstein’s **conception of science:’**”

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## Chapter 3, Science as a Process, second and third to last paragraph

“As the Venn diagram shows, the set of narratives (2) is a subset of the set of products of intuition (1); the set of philosophical theories (3) and the set of scientific theories that predict (5) are subsets of the set of narratives (2); and the set of scientific theories that explain (4) is a subset of the set of philosophical theories (3).

“From this process-oriented perspective, the difference between science (4 and 5) and narration (2), both refinements (subsets) of intuition (1), is not as great as Russell would have us believe.”

were deleted. Also, the Venn diagram was moved forward four paragraphs.

## Chapter 3, Science as a Process, last paragraph, first two sentences

“This concept of science allows us to distinguish easily between *how we know* (intuition, narration, philosophy, and science) and *what we know* (astronomy, religion, chemistry, botany, history, etc.). In theory, we can explain what happens in economies scientifically.”

was changed to:

“This concept of science allows us to explain what happens in economies scientifically.”

## Chapter 6, second paragraph, fourth sentence

“Aggregate production would fall and unemployment and inflation would rise.”

was changed to:

“Economists would record an immediate fall in aggregate production and rise in unemployment and inflation.”

## Chapter 6, Introduction, fifth paragraph, first sentence

“Whether economists choose to recognize it or not, the information revolution’s ever increasing potential for rapid learning exacerbates both of these measurement problems.”

was changed to:

“The information revolution’s ever increasing potential for rapid learning exacerbates both of these measurement problems.”



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Version 2002.04.06

## Title Page, Afterword

Changed “Scott Harris” to “Scott M. Harris” after discovering the existence of economist (Richard) Scott Harris.

## Chapter 1, Modern Economics Blind Spot, last paragraph, last sentence

Dropped the footnote:

“Applying a learning curve to a marginalist economic model is not new. Kenneth Arrow did it in his 1962 American Economic Review article, *The Implications of Learning by Doing*. There can be little doubt that the widespread failure to abandon the EOQ model for the rapid tool setting model for another two decades cost many tens of billions of dollars, perhaps more. What does this say about the relationship between economists and the people who use their products? How can economists get closer to their customers, the people who use their theories and the concepts derived from their theories? Finding a problem is like finding a diamond. Without a problem to solve, there can be no improvement.”

## Chapter 1, Efficiency and Effectiveness, second paragraph

“**Before moving on, it is important to note** that the distinction between efficiency and effectiveness varies with the scale of the problems being considered. The focus here is on the problems of individual economic agents. The scale is that of microeconomics.”

was converted into the following footnote at the end of the first paragraph:

“**Note** that the distinction between efficiency and effectiveness varies with the scale of the problems being considered. The focus here is on the problems of individual economic agents. The scale is that of microeconomics.”

## Chapter 1, Efficiency and Effectiveness, third paragraph, first two sentences

“This managerial concept of excellence in means recognizes that we can **choose to invest scarce resources to obtain additional knowledge, which may lead us to choose a better problem to solve**. Rather than making the “best” use of scarce resources **for a given stock of knowledge**, it makes the “best” use of **available knowledge and scarce resources**.”

was changed to:

“This managerial concept of excellence in means recognizes that we can **learn**. Rather than making the best use of scarce resources **for a given stock of knowledge**, it makes the best use of **scarce resources and available knowledge**.”

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### Chapter 2, Introduction, first paragraph, second sentence

“Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to illustrate the potential virtuous circle **between** the division of labor and the expansion of market size.”

was changed to:

“Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to illustrate the potential virtuous circle **involving** the division of labor and the expansion of market size.”

### Chapter 2, last paragraph, last sentence

Added the following Summary:

“Traditional manufacturing aims at producing efficiently. JIT manufacturing aims at producing ever more wisely. This difference is manifest in the practice of allowing any production line worker to stop an entire line in order to solve a pressing problem. To traditional manufacturers, this practice is irrational. To JIT manufacturers, it is common sense.”

### Chapter 3, Introduction, first two subsections

Moved *Excellence* to behind *Subjectivity*..

### Chapter 3, *Subjectivity*, first paragraph, last two sentences

“Because what we conceive depends on the concepts that we use, all conceptual models, **which is to say** all theories, are subjective.\* We would be foolish to discard theories based on how **objective** they seem to us.”

was changed to:

“Because what we conceive depends on the concepts that we use, all conceptual models, **hence** all theories, are subjective.\* We would be foolish to discard theories based on how **subjective** they seem to us.”

### Chapter 3, The Strategy for Choosing Economic Explanations, second and third paragraphs

“Developing theories involves choosing a level of abstraction, which is a matter of finding objects that we can predict or explain. We can study subjects on more than one such level. For example, we can study matter and energy on a subatomic scale with quantum mechanics, a molecular scale with chemistry, a human scale with Newtonian

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dynamics, or a cosmic scale with relativity theory. Which scale is best depends on what we are trying to do.

“Since the Keynesian revolution, most economists have studied their subject on two levels, microeconomics and macroeconomics. This split is a partial one in that these two approaches share the same basic conceptual framework and the same focus on prediction. The information revolution has created the need for a new, more complete split. We need theories that explain what happens in economies, to complement marginalist theories that predict what will happen in markets.”

were deleted.

### Chapter 4, Introduction, first paragraph, last sentence

“This chapter proposes means of eliminating simplistic and unethical theories **from this set of theories.**”

was changed to:

“This chapter proposes means of eliminating simplistic and unethical **teleonomic** theories.”

### Chapter 5, *Pleasure and Pain*, third paragraph, last sentence

“Pain (in acting) is anything that **impedes our becoming absorbed** in activity.”

was changed to:

“Pain (in acting) is anything that **interferes with losing ourselves** in activity.”

### Chapter 5, *Pleasure and Pain*, eighth paragraph, second sentence

“**Masters** swimmers find pleasure in swimming.”

was changed to:

“**Recreational** swimmers find pleasure in swimming.”

### Chapter 5, *Pleasure and Pain*, ninth paragraph, second and third sentences

“Further, finding pleasure in an activity can improve the performance of that activity. Becoming absorbed in swimming can help **us** swim **better**. **Our** performance usually suffers when something painful, such as a sore shoulder, interferes with **our** swimming. Similarly, becoming absorbed in thinking makes it easier to solve problems. We are usually less able to solve a problem if something painful, such as a headache, impedes **our** thinking.”

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was changed to:

“Further, finding pleasure in an activity can improve the performance of that activity. Becoming absorbed in swimming can help **competitive swimmers** swim **faster**. **Performance** usually suffers when something painful, such as a sore shoulder, interferes with **becoming absorbed in** swimming. Similarly, becoming absorbed in thinking makes it easier to solve problems. We are usually less able to solve a problem if something painful, such as a headache, impedes **losing ourselves in** thinking.”

### Chapter 5, *Three Common Misconceptions*, first paragraph, last sentence

“Early American failures to achieve similar results warn us that this impressive means of inducing knowledge requires **a dynamic world-view**.”

was changed to:

“Early American failures to achieve similar results warn us that this impressive means of inducing knowledge requires **recognizing the possibility of improving the means of trade**.”

### Chapter 5, *Excellence in Production*, first paragraph, last sentence

“Such joint production requires **both** people that have the practical wisdom to think of better ways to produce **and** trading relationships that support the exchange of sensitive information. **Specifically**, managers must trust their employees with valuable information about products, processes, customers, and suppliers, and employees must trust managers with information that potentially replaces their services.”

was changed to:

“Such joint production requires people that have the practical wisdom to think of better ways to produce. **It also requires** trading relationships that support the exchange of sensitive information. **Managers** must trust their employees with valuable information about products, processes, customers, and suppliers, and employees must trust managers with information that potentially replaces their **current** services.”

### Chapter 7, *Conclusion*, first paragraph, last two sentences

“The ‘**simple-minded**’ perceive a world filled with simple problems that are not being solved, hence they desire to give someone who recognizes the problems they see the power to solve them. In contrast, the ‘**muddle-headed**’ perceive a world filled with complex problems, which are best solved through decentralization.”

was changed to:

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“The **centralizers** perceive a world filled with simple problems that are not being solved, hence they desire to give someone who recognizes the problems they see the power to solve them. In contrast, the **decentralizers** perceive a world filled with complex problems, which are best solved through decentralization.”

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## Version 2002.04.10

### Chapter 2, Introduction

Moved paragraphs on subjectivity down to below paragraphs on products. Rewrote section to eliminate subsection headings (Subjectivity, Excellence, and Products). This involved deleting the last line of the first paragraph, emphasizing the first line of the first sentence of what had been the opening paragraphs of the Excellence and Products subsections, and adding the opening sentence, “Theories are subjective.” to what had been the Subjectivity subsection.

### Chapter 2, Introduction, first (now second) footnote, last paragraph

“Dismissing theories that use the marginalist concept of excellence in means leaves us with an apparently simple explanation of prices: *prices are a consensus of economic agents’ beliefs about value as revealed by their actions*. Marginalist economists currently use this when extending their analysis to capital assets, the value of which depends on investors’ expectations and risk preferences.”

was deleted.

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## Version 2002.04.16

### Preface, fifth paragraph, third sentence

“In economies with the potential for rapid change, the potential interactions between **ethics (our ultimate ends and how we progress toward them) and modern economics (how we use scarce resources to satisfy our wants)** are too important to ignore.”

was changed to:

“In economies with the potential for rapid change, the potential interactions between **ethics and modern economics, between the studies of how we progress toward our ultimate ends and how we use scarce resources to satisfy our wants,** are too important to ignore.”

### Preface, seventh paragraph, second sentence

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“I also envision a means for all of us **intelligent beings**, working together, to solve this problem.”

was changed to:

“I also envision a means for all of us, working together, to solve this problem.”

---

### **Version 2002.04.25**

#### **Preface, first paragraph**

Inserted the following paragraph:

“Economists once aspired to be worldly philosophers, literally lovers of useful knowledge. Had the economics profession remained faithful to this calling, modern economics would be the science of useful knowledge. The phrase ‘economics of knowledge’ would be redundant, not radical. Unhappily, it is not.”

#### **Preface, sixth paragraph, first two sentences**

“Smith’s great simplification **is fundamental to how nearly all economists understand their subject. However, it** tends to blind us to many of the opportunities of the information age.”

was changed to:

“Smith’s great simplification tends to blind us to many of the opportunities of the information age.”

#### **Preface, eighth paragraph**

The paragraph was recombined with the preceding paragraph. The two last sentences:

“For academics, this strategy is an outline for a research program. For all of us, it is a first cut at a plan for living and working together.”

were deleted.

#### **Seventh chapter, Just Taxation, second paragraph, fourth through last sentences**

“For example, the United States **currently spends a large portion of its military budget protecting oil supplies in politically unstable parts of the world. A slowly escalating tax on oil would induce knowledge that replaces oil with tolerable turbulence. The**

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justification is the same as it is for knowledge induction in JIT manufacturing, sacrificing some current production in order to become more productive.”

was made into a new paragraph. It was also changed to:

“For example, the United States can induce new useful knowledge that replaces oil with tolerable turbulence by slowly escalating taxes on oil. In addition to lowering the demand for oil, this will provide an example of inducing new knowledge by means of just taxation. Over time, lowering the demand for oil and providing an example of inducing new knowledge will reduce the risk of war over oil.”

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### Version 2002.05.11

#### Acknowledgments, first paragraph, last two sentences

“The first is Fredrick Sontag, who inspired me and countless other Pomona College students and alumni. He was extremely generous with his time when I needed it most.”

was changed to:

“The first is Fredrick Sontag, Pomona College’s much beloved professor of philosophy and theology. Fred was extremely generous with his time when I needed it most.”

#### Acknowledgments, fourth paragraph, second sentence

“My senior year in college I took an independent study course in human capital theory from Gordon, which focused on Gary Becker’s pioneering work and Lester Thurow’s criticisms of it.”

was changed to:

“My senior year in college I took an independent study course in human capital theory from Gordon. The core of the course was Gary Becker’s pioneering work and Lester Thurow’s criticisms of it.”

#### Acknowledgments, fourth paragraph, fifth sentence

“Gordon apparently recognized that my inability to produce the required term paper was due more to profound frustration and confusion than to sloth.”

was changed to:

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“Gordon apparently recognized that my inability to produce the required term paper was **more due** to profound frustration and confusion than to sloth.”

### Chapter 7, *Control the Money Supply Passively*, first paragraph, last two sentences

“Of the four **combinations** created by these two choices, the **most centralized is the current practice of controlling the price of money actively. The most decentralized approach** is to control the money supply passively.”

was changed to:

“Of the four **alternatives** created by these two choices, the most decentralized is to control the money supply passively.”

### Chapter 7, *Control the Money Supply Passively*, second paragraph, first sentence

“The case for controlling the money supply passively is not that it **minimizes turbulence or even that it** yields better decisions in the short run, but that it yields better decisions in the long run.”

was changed to:

“The case for controlling the money supply passively is not that it yields better decisions in the short run, but that it yields better decisions in the long run.”

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## Version 2002.05.15

### Acknowledgments, second paragraph, third sentence

“In it I found a form of pragmatism (searching for useful truth) more palatable to modern intellectuals and intelligent laymen than **that of** William James (recognizing truth by its usefulness).”

was changed to:

“In it I found a form of pragmatism (searching for useful truth) more palatable to modern intellectuals and intelligent laymen than **the popular interpretation of** William James’s **pragmatism** (recognizing truth by its usefulness).”

### Chapter 5, *Dualist Worldly Ends*, sixth paragraph, second sentence

“Examples include Mayan ball games that culminated in the ritual beheading of the captain of the **winning** team, Jainist suicide by starvation, and Japanese kamikaze.”



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was changed to:

“Examples include Mayan ball games that culminated in the ritual beheading of the captain of the **losing** team, Jainist suicide by starvation, and Japanese kamikaze.”

## Chapter 6, Introduction, fourth paragraph, last sentence

“How much more valuable is **the average** personal computer **manufactured** today than **one manufactured** ten years ago?”

was changed to:

“How much more valuable is **a three thousand dollar** personal computer **purchased** today than **a similarly priced personal computer** purchased ten years ago?”

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## Version 2002.05.22

### Chapter 4

“Misleadingly simplistic” implies an ultimate end. The common sense based ultimate end implied in “Eliminating Simplistic Theories” was replaced by the explicitly defined ultimate end of reverence for life. To accomplish this in the most straightforward manner, the section titled “Eliminating Simplistic Theories” was moved to the end of the chapter. The section titled “Eliminating Unethical Theories” was reorganized. The introductory paragraphs were moved into the chapter introduction. The the three subsections, “*Materialist Ultimate Ends*,” “*Dualist Worldly Ends*,” and “*Reconciliation*,” were promoted. This reorganization required making changes throughout the chapter.

### Chapter 4, Introduction, first paragraph, second and third sentences

“We can tighten this loose theory by **tightening the core theory of means**. **We can also tighten it by** eliminating members from the set of ultimate ends.”

was changed to:

“We can tighten this loose theory by eliminating members from the set of ultimate ends.”

### Chapter 4, Introduction, first paragraph, last sentence

“This chapter proposes means of eliminating **simplistic and unethical** teleonomic theories.”

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was deleted.

### **Chapter 4, Introduction, second paragraph, first sentences**

“If we can agree on what our highest ethical end is, then we can develop a powerful means of eliminating teleonomic theories. The major difficulty in doing so is agreeing on metaphysical assumptions about human nature.”

was changed to:

“The major difficulty in developing means of eliminating teleonomic theories is agreeing on metaphysical assumptions about human nature.”

### **Chapter 4, Introduction, third paragraph**

“The following explores the materialist view of the good life, goes on to explore dualist worldly ends, and finishes by reconciling the materialist and dualist views. If we accept this pragmatic reconciliation, then we will have another means of tightening our loose theory of means.”

was changed to:

“This chapter proposes a pragmatic means of reconciling the materialist and dualist views. It then uses this reconciliation to develop a powerful means of eliminating teleonomic theories.”

### **Chapter 4, Dualist Worldly Ends, twelfth paragraph, second sentence**

Added the following footnote:

“Although most of us identify this metaphysic with Christianity, belief in a three element Godhead is common among mystics of all major religions. This Godhead consists of an unchanging Absolute, which is usually envisioned as being male, His creative spirit, which manifests itself as the Universe and is usually envisioned as being female, and a divine element within us, which is our true self. Where Christians after the Council of Nicaea speak of the Father and Son (Logos), Sufis speak of Haqq and Khalq, Kabbalists of En Sof and Sefirot; Chan (Zen) Buddhists of Hsin (Kokoro) and Nien (Nen); and Taoists of Tao and Teh. The Vedas tell of Prajapati and Prthivi; the Upanishads of Brahman and Maya; and the Psalms of Jahveh and Chokmah. For more on this read Hindu mystic S. Abhayananda’s book, *History of Mysticism: The Unchanging Testament*, (Olympia, WA: Atma Books, 1996), particularly page 387.”

This required renumbering endnotes 8-25. It also required changing the footnote symbols in the online version.

### **Chapter 4, Reconciliation, first paragraph, first sentence**

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“If we seek what is *true*, the materialist and dualist belief systems are irreconcilable:”

was changed to:

“If we seek what is *true in the way that modern economists use this term*, the materialist and dualist belief systems are irreconcilable:”

### Chapter 4, Eliminating Simplistic Theories, first paragraph, second through fourth sentences

“*We can begin eliminating teleonomic theories by eliminating simplistic ones.* To help us identify *such* theories, we can think of ourselves as complex adaptive systems consisting of individual elements, each having its own set of needs. This suggests that we should eliminate theories that are based on a single element *or* type of element.”

was changed to:

“To help us identify *simplistic teleonomic* theories, we can think of ourselves as complex adaptive systems consisting of individual elements, each having its own set of needs. This suggests that we should eliminate theories that are based on a single element, type of element, *or level of abstraction.*”

### Chapter 4, Eliminating Simplistic Theories, eighth paragraph

Deleted the following sentences and corresponding endnote:

“Although most of us identify this metaphysic with Christianity, belief in a three element Godhead is common among mystics of all major religions. This Godhead consists of an unchanging Absolute, which is usually envisioned as being male, His creative spirit, which manifests itself as the Universe and is usually envisioned as being female, and a divine element within us, which is our true self. Where Christians after the Council of Nicaea speak of the Father and Son (Logos), Sufis speak of Haqq and Khalq, Kabbalists of En Sof and Sefirot; Chan (Zen) Buddhists of Hsin (Kokoro) and Nien (Nen); and Taoists of Tao and Teh. The Vedas tell of Prajapati and Prthivi; the Upanishads of Brahman and Maya; and the Psalms of Jahveh and Chokmah.”

### Chapter 4, Summary, first paragraph, first three sentences

“This chapter proposed *two* means of eliminating teleonomic theories. *The first involves eliminating theories based on their correspondence to our perceptions of reality and general completeness. The second involves eliminating theories inconsistent with the normative end of reverence for life.*”

was changed to:

“*This chapter proposed a pragmatic means of eliminating teleonomic theories.*”

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## Chapter 4, Summary, footnote, first sentence

“Both processes yield descriptions.”

was changed to:

“Teleonomic theories are descriptions.”

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Version 2002.05.27

## Preface, ninth paragraph, second sentence

Inserted the sentence:

“Providing such a framework is the first step in any plan for working and living together.”

Began new paragraph after inserted sentence.

## Chapter 4, Introduction, second paragraph:

Inserted the following paragraph:

“For the time being, we can safely assume that we, intelligent beings capable of using the knowledge that we create in order to achieve our ultimate ends, are all human. Modern biology tells us that life is a complex adaptive system in which everything is changing. Fortunately, human beliefs and behaviors change many orders of magnitude faster than human genetics. We can safely assume that human nature is fixed. This is the foundation of all humanistic ethical theories, all theories about human ultimate ends and the best means to them, that are based on teleonomic theories.”

## Chapter 4, Introduction, (former) third paragraph, first sentence:

“This chapter provides (1) a general description of set of materialist teleonomic theories, (2) a general description of 'humanistic' dualist worldly ends, and (3) a pragmatic reconciliation of these two logically incompatible sets of teleonomic theories.”

## Chapter 4, Materialist Ultimate Ends, first paragraph

“Modern biology tells us that life is a complex adaptive system in which everything is changing. However, we know that what we human beings think and do changes much more quickly than our genetics. We can safely assume that our nature is fixed. This is the foundation of humanistic ethics.”

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was deleted.

### Chapter 4, Materialist Ultimate Ends, third footnote

“Anything less than complete ignorance will introduce bias. For example, if we simply imagine that we were born into our current society, we will tend to ignore the potential affect of our behavior on members of other human societies, future generations of humans, and non-human life. Whenever we are tempted to use ‘social justice’ we should consider substituting either ‘tribal justice’ or ‘justice’ depending on what we mean to say.”

was changed to:

“Anything less than complete ignorance will introduce bias. For example, if we simply imagine that we were born into our current society, we will tend to ignore the potential affect of our behavior on members of other human societies, future generations of humans, and non-human life. **Using Rawls’s means, we can argue that incomplete forms of “ethical mysticism” permit unjust predation and exploitation. We also can argue that they permit unjust limitations on cooperation. The most obvious examples are restrictions on “foreign” trade. These limit cooperation with living members of other societies. Less obvious are actions that effectively limit cooperation with future generations. Justice requires a recursive agreement between generations similar in form and spirit to the Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants. Each generation must seek to maximize the amount of progress for the turbulence it can bear. Each generation must ask itself, “If not now, when? If not us, who?” Shielding a favored group from change violates this agreement. “Social justice” is not the highest form of justice. Whenever we are tempted to use ‘social justice’ we should consider substituting either ‘tribal justice’ or ‘justice’ depending on what we mean to say.”**

### Chapter 4, Materialist Ultimate Ends, fifth through third paragraphs from the end

“Given this theory of justice, we can say that incomplete forms of “ethical mysticism” permit unjust predation and exploitation. We also can say that they unjustly limit cooperation, which retards the creation and application of useful knowledge. The most obvious example of this is restrictions on “foreign” trade, which limit cooperation with living members of other societies.

“Less obvious, incomplete forms of “ethical mysticism” restrict cooperation with future generations of intelligent life. Consider the communitarian concept of justice. By protecting the status quo, communitarians raise the cost of change, which unjustly retards the implementation of new knowledge.

“Justice requires that we seek not to minimize turbulence in the flow of economic resources but to maximize the amount of progress for the turbulence that we can bear. This recursive agreement between generations is similar in form and spirit to the

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Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants. The sixth and seventh chapters discuss this in greater detail.”

were deleted.

### Chapter 4, Dualist Worldly Ends, seventh paragraph, second sentence

“**Assuming** that we cannot agree that any of us have the ability to communicate with beings familiar with the afterlife, we cannot test these beliefs.”

was changed to:

“**Given** that we cannot agree that any of us have the ability to communicate with beings familiar with the afterlife, we cannot test these beliefs.”

### Chapter 8, second paragraph, second to last sentence

“It tells us that we should judge the interventions of governments rather than the actions of individuals and that we should err on the side of **not passing just interventions** rather than **passing unjust ones**.”

was changed to:

“It tells us that we should judge the interventions of governments rather than the actions of individuals and that we should err on the side of not **intervening justly** rather than **intervening unjustly**. **Like physicians, governments should first do no harm**.”

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## Version 2002.06.01

### Chapter 4, Introduction, first paragraph, last sentence

Moved the clause:

“providing such a framework is the first step in any plan for working and living together.”

from the last sentence of the footnote to the reference sentence. Also eliminated the italics from *teleonomic theories* in the footnote.

### Chapter 4, Introduction, footnote, second paragraph, first sentence

“The major difficulty in developing means of eliminating teleonomic theories is agreeing on metaphysical assumptions about **human** nature.”

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was changed to:

“The major difficulty in developing means of eliminating teleonomic theories is agreeing on metaphysical assumptions about **our** nature.”

### **Chapter 4, Introduction, footnote, last paragraph**

“This chapter proposes a pragmatic means of reconciling **the** materialist and dualist **views**. It then uses this reconciliation to develop **a powerful** means of eliminating **teleonomic** theories.”

was changed to:

“This chapter proposes a pragmatic means of reconciling materialist and dualist **teleonomic theories**. It then uses this reconciliation to develop means of eliminating **unethical and simplistic** theories.”

### **Chapter 4, Materialist Ultimate Ends and Dualist Worldly Ends**

These two sections were demoted to subsections of a new section, **Reconciling Teleonomic Theories**. They were also renamed **Secular Humanist Ultimate Ends** and **Religious Humanist Worldly Ends**.

### **Chapter 4, Reconciliation**

The two paragraphs in this section were moved forward to become the first two paragraphs in **Reconciling Materialism and Dualism**. The section title was deleted.

### **Chapter 4, Reconciling Teleonomic Theories**

Inserted the following two paragraphs to the end of the introduction:

“As previously stated, strategic economic theories ought to concern what beings capable of using the knowledge that they create would do if they were wise. Is Schweitzer’s ultimate end of reverence for life wise? A thorough examination of this issue exceeds the bounds of this essay. In its place, the author offers his views of how Schweitzer’s reverence for life fits into secular and religious humanism, humanity’s materialist and dualist teleonomic traditions.

“In addition to supporting the claim that reverence for life is wise, the following two sections introduce a number of useful concepts. These include the humanist definition of happiness, the need for ‘mystical oneness,’ and normative (versus temporal) ends.”

### **Chapter 4, Secular Humanist Ultimate Ends, first paragraph**

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“Modern biology tells us that life is a complex adaptive system in which everything is changing. However, we know that what we human beings think and do changes much more quickly than our genetics. We can safely assume that our nature is fixed. This is the foundation of humanistic ethics.”

was deleted.

### **Chapter 4, Secular Humanist Ultimate Ends, new first paragraph**

“Humanist philosophers believe that the ultimate end of human life is happiness, which **is** a good life, **that is**, a life well lived. They claim that the statement, “the ultimate end of life is a good life,” has meaning, as opposed to simply being true by definition. To have meaning, a statement must tell us something more than is contained in the statement alone. This statement has meaning because it focuses our attention on what we need in order to live a good life.”

was changed to:

“Humanist philosophers believe that the ultimate end of human life is happiness, which **they define as** a good life, a life well lived. They claim that the statement, “the ultimate end of life is **living** a good life,” has meaning, as opposed to simply being true by definition. To have meaning, a statement must tell us something more than is contained in the statement alone. This statement has meaning because it focuses our attention on what we need in order to live a good life.”

### **Chapter 4, Eliminating Simplistic Theories, section heading**

“Simplistic” was changed to “Teleonomic.”

### **Chapter 4, Eliminating Teleonomic Theories, first paragraph**

Inserted the following paragraph:

“If we accept that reverence for life is wise, then we can develop two means of eliminating teleonomic theories. The first is simply to eliminate theories that are clearly incompatible with Schweitzer’s ultimate normative end of reverence for life. The most obvious examples are theories based on too narrow a conception of who ‘we’ are. The second is to eliminate misleadingly simple theories, theories that don’t yield the most useful problems to solve.”

### **Chapter 4, Eliminating Teleonomic Theories, first paragraph, first three sentences**

“Beautiful theories are simple but not too simple. To help us identify simplistic theories, we can think of ourselves as complex adaptive systems consisting of individual elements, each having its own set of needs. This suggests that we should



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eliminate theories that are based on a single element, type of element, or level of abstraction.”

was replaced by:

“We find useful theories that explain causation at various levels of abstraction. For example, Maslow’s ‘becoming’ needs naturally fall into two categories, physical needs and mental needs. We study these two types of needs at different levels of abstraction. Some materialists even claim that our minds ‘emerge’ from our bodies.

“The fact that we find useful theories about human needs at various levels of abstraction suggests that we should beware of theories based on any one level of abstraction.”

### Chapter 4, Summary

“This chapter proposed a pragmatic means of eliminating teleonomic theories.<sup>++</sup> What remains is a set of theories that deserve our tolerance. This tolerance is based on our **ignorance** of our ultimate ends and of the best means to them, rather than on the presumed right to do as we please.”

was replaced by:

“This chapter proposed pragmatic means of eliminating **unethical and simplistic** teleonomic theories.<sup>++</sup> What remains is a set of theories that deserve our tolerance. This tolerance is based on our **incomplete knowledge** of our ultimate ends and of the best means to them, rather than on the presumed right to do as we please.”

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### Version 2002.06.08

### Chapter 4

Removed quotation marks around all but first occurrences of ‘mystical oneness,’ ‘ethical mysticism,’ and ‘magical mysticism.’

### Chapter 4, Introduction, last paragraph, last sentence

“It then uses this reconciliation to develop means of eliminating **unethical and simplistic** theories.”

was replaced by:

“It then uses this reconciliation to develop means of eliminating **teleonomic** theories.”

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### Chapter 4, Reconciling Teleonomic Theories, second paragraph

“However, if we seek what is *useful*, we can reconcile these two logically incompatible belief systems. **In order to do so, we need to recognize two facts. First, belief in either the dualist or materialist system is based on faith in metaphysical assumptions. By definition, we currently have no generally accepted means of disproving these assumptions. Second, by expanding the scope of our ethical, economic, and political problem to its logical limit, we can find common ground. Both materialists and dualists can agree on Schweitzer’s ultimate end of reverence for life.**”

was replaced by:

“However, if we seek what is *useful*, we can reconcile these two logically incompatible belief systems. **Materialists and dualists can agree on Schweitzer’s ultimate end of reverence for life.**”

### Chapter 4, Secular Humanist Ultimate Ends, first paragraph, last sentence

“**This** statement has meaning because it focuses our attention on what we need in order to live a good life.”

was replaced by:

“**In this case, the** statement has meaning because it focuses our attention on what we need in order to live a good life.”

### Chapter 4, Secular Humanist Ultimate Ends, sixth paragraph, first sentence

“Each of us has a structure (system) of beliefs.”

was replaced by:

“Each of us has a structure (system) of beliefs (**ideas/knowledge**).”

### Chapter 4, Secular Humanist Ultimate Ends, last paragraph

“In summary, the **materialist good life is a life spent** as high in our hierarchy of needs as possible. The higher we go in this hierarchy, the more important culture becomes relative to nature. At the top of this hierarchy is the need for mystical oneness, which we can satisfy best with a practical combination of magical and complete ethical mysticism.”

was replaced by:

“In summary, **secular humanist ultimate end is living a good life, which we achieve by living** as high in our hierarchy of needs as possible. The higher we go in this

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hierarchy, the more important culture becomes relative to nature. At the top of this hierarchy is the need for mystical oneness, which we can satisfy best with a practical combination of magical and complete ethical mysticism.”

### Chapter 4, Secular Humanist Ultimate Ends, thirteenth paragraph, first sentence

“Schweitzer’s magical mysticism lies beyond ethics.”

changed to:

“Magical mysticism lies beyond ethics.”

### Chapter 4, Secular Humanist Ultimate Ends, thirteenth paragraph, first sentence

“Schweitzer’s ethical mysticism does not involve this problem.”

changed to:

“Ethical mysticism does not involve this problem.”

### Chapter 4, Secular Humanist Ultimate Ends, fifteenth paragraph

“Schweitzer saw an uneasy mix of magical and ethical means of satisfying this need in the history of both Indian and Western thought. In the development of Indian thought, he saw a slow evolution from the predominance of magical mysticism in ancient Hindu teachings, which denied the reality of this world, to that of the ethical mysticism in Japanese Buddhist sects, which early Jesuit missionaries denounced as being Lutheran.<sup>11</sup> In the development of Western thought, he saw magical mysticism dominating in the late Hellenic and Medieval period and ethical mysticism making a revival in the Renaissance and becoming supreme during the Enlightenment.<sup>12</sup>”

changed to:

“Schweitzer saw an uneasy mix of magical and ethical means of satisfying our need for mystical oneness. He believed that this uneasy mix explained the very different trajectories of Eastern and Western religious thought. In the development of Eastern thought, he saw a slow evolution from the predominance of magical mysticism in ancient Hindu teachings, which denied the reality of this world, to that of the ethical mysticism in Japanese Buddhist sects, which early Jesuit missionaries denounced as being Lutheran.<sup>11</sup> In the development of Western thought, he saw magical mysticism dominating in the late Hellenic and Medieval period and ethical mysticism making a revival in the Renaissance and becoming supreme during the Enlightenment.<sup>12</sup>”

### Chapter 4, Secular Humanist Ultimate Ends, seventeenth paragraph, first sentence

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“Schweitzer recognized that the great disadvantage of magical mysticism is that it is impracticable.”

changed to:

“The great disadvantage of magical mysticism is that it is impracticable.”

### Chapter 4, Secular Humanist Ultimate Ends, eighteenth paragraph, first sentence

“Schweitzer’s ethical mysticism also has advantages and disadvantages.”

changed to:

“Ethical mysticism also has advantages and disadvantages.”

### Chapter 4, Secular Humanist Ultimate Ends, nineteenth paragraph

“Schweitzer states that all life is to be revered. Because most forms of life survive by killing other life forms or by feeding on their remains, it is clearly naïve to wish that no living thing suffer or die. What complete ethical mysticism aims at is avoiding unnecessary suffering and killing. However, it is not immediately clear that this ideal yields a practical means of judging the justice of the actions, customs, and laws of intelligent beings. Does it require that we treat rats the same as humans?”

changed to:

“Some claim that reverence for life, the basis for ethical mysticism, is too idealistic; that it provides too little practical guidance. They argue that we need to kill other life forms if we are to survive. It is clearly naïve to wish that no living thing suffer or die. In making this argument, they confuse temporal and normative ends. Complete ethical mysticism aims at avoiding *unnecessary* suffering and killing, not all suffering and killing. It tells us to do what we can to minimize suffering and killing.”

### Chapter 4, Secular Humanist Ultimate Ends, twentieth paragraph, first sentence

“Moral philosopher John Rawls provides a means of translating Schweitzer’s ideal into a more practical means of judging our actions, customs, and laws.”

changed to:

“Others claim that the principle of reverence for life provides too little practical guidance. Moral philosopher John Rawls provides a means of judging our actions, customs, and laws, which we can apply to the principle of reverence for life.”

### Chapter 4, Secular Humanist Ultimate Ends, twentieth paragraph, last sentence

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“Humans should neither treat **rats** as equals, nor treat them with no regard.”

changed to:

“Humans should neither treat **less intelligent forms of life** as equals, nor treat them with no regard.”

### Chapter 4, Secular Humanist Ultimate Ends, twenty-first paragraph, first four sentences

“Schweitzer **advocated that we embrace complete ethical mysticism rather than either one of its incomplete forms or magical mysticism. He** believed that combining magical and ethical mysticism is a logical impossibility in that the former requires us to deny the world and life while the latter requires us to embrace them. **However, several traditions claim that this is possible. We** can combine magical and ethical mysticism by setting our objectives according to ethical mysticism, but acting according to magical mysticism.”

changed to:

“Schweitzer believed that combining magical and ethical mysticism is a logical impossibility in that the former requires us to deny the world and life while the latter requires us to embrace them. **He failed to recognize that we** can combine the best of magical and ethical mysticism by setting our objectives according to ethical mysticism, but acting according to magical mysticism.”

### Chapter 4, Religious Humanist Worldly Ends, seventh through eleventh paragraphs and first sentence of twelfth paragraph

“The most straightforward means of dismissing ritual death is to refute those individual beliefs about the means to the ultimate ends of existence that support them. Given that we cannot agree that any of us have the ability to communicate with beings familiar with the afterlife, we cannot test these beliefs. This leaves us with the difficult task of proving that the belief systems supporting ritual death are somehow flawed. The most common flaw is incompleteness.

“The purest example of ritual death involving the belief that sacrifice leads to the ultimate end is the twenty-five hundred year old Jainist tradition of choosing to starve to death rather than continue killing other living beings in order to survive. Jainists believe that (1) ritual suicide by starvation is the culmination of countless cycles of death and reincarnation on the road to perfection; (2) all forms of life participate in the cycle of death and rebirth and so are equally precious; (3) once a person has reached perfection (sainthood) there is no need to continue to live; and (4) a saint’s death by starvation will help all life advance toward perfection, as it stops the saint from killing other living beings in order to survive.

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“The Jainist belief system is flawed in that it assumes that a saint’s suicide will help life more than living a life dedicated to promoting life. In economic terms, Jainists believe that they live in a zero or negative sum world. This is very rarely the case. If it is possible to help life by living a life devoted to it, suicide means choosing immediate bliss over postponing bliss to help others, which makes a Jainist saint’s suicide by starvation an act of self-centeredness rather than self-sacrifice.

“The Viking belief that death in battle leads to Valhalla is a relatively pure example of ritual death involving the belief that dying in a state of ecstasy leads to the ultimate end. This belief led Viking warriors to prefer death in battle to a good life ending in a peaceful death. In considering whether a warrior’s choice to continue to fight until the day he dies in battle is wise, it is not clear that death in battle is the best means to Valhalla. It may be possible to experience ecstasy in life, to pursue happiness, and to find ecstasy in death by remembering the experience of ecstasy in life. If so, the Viking can both reach Valhalla and live a good life.

“In both of these examples, the belief system is flawed because it does not capture important aspects of reality. Are all belief systems that support ritual death as incomplete as these two?”

“All forms of ritual death aim at self-sacrifice, bliss through ecstasy, or some combination of the two.”

were deleted. The balance of the twelfth paragraph was merged into the sixth paragraph.

### **Chapter 4, Religious Humanist Worldly Ends, new eighth paragraph, second sentence**

“Christian philosopher **and mystic** Sören ...” was changed to: “Christian philosopher Sören ...”

### **Chapter 4, Religious Humanist Worldly Ends, end**

Inserted the paragraph:

“In summary, religious humanist ultimate normative end of life is living a good life, which we achieve by living as high in our hierarchy of needs as possible. At the top of this hierarchy is Schweitzer’s need for mystical oneness, which we can satisfy best with a practical combination of magical and complete ethical mysticism. Achieving mystical oneness by relinking with the divine element within ourselves may cause us to assume the subordinate normative end of the divine, which is to bring ever more divine consciousness into the world.”

### **Chapter 4, Eliminating Teleonomic Theories, first paragraph, last sentence**

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“The second is to eliminate misleadingly simple theories, theories that don’t yield the **most useful** problems **to solve**.”

changed to:

“The second is to eliminate misleadingly simple theories, theories that don’t yield the **best** problems **for achieving the ultimate end of reverence for life**.”

### **Chapter 4, Eliminating Teleonomic Theories, second paragraph**

“We find useful theories that explain causation at various levels of abstraction. For example, Maslow’s ‘becoming’ needs naturally fall into two categories, physical needs and mental needs. We study these two types of needs at different levels of abstraction. Some materialists even claim that our minds “emerge” from our bodies.”

changed to:

“Maslow’s hierarchy of needs suggests a method of discovering misleading theories. Again, he discovered needs by investigating the causes of distress and illness. What he found naturally fell into three categories, physical needs, mental needs, and spiritual needs. These three types of needs emerge on at least two levels of abstraction. Our physical needs emerge at the molecular level. For example, our need for oxygen, water, and nutrition arise from our molecular processes’ need for oxygen, water, and nutrition. In contrast, our mental needs arise from our minds, not from the molecular processes of our brain cells. Molecular processes have no need for love or self-respect. Arguably, our spiritual needs emerge at an even higher level of abstraction than our mental needs.”

### **Chapter 4, Eliminating Teleonomic Theories, third paragraph, first sentence**

“The fact that our needs emerge at more than one level of abstraction suggests that we should beware of **any theory that attributes** human motivation to **any one** level of abstraction.”

changed to:

“The fact that our needs emerge at more than one level of abstraction suggests that we should beware of **teleonomic theories that concern a single** level of abstraction.”

### **Chapter 4, Eliminating Teleonomic Theories, third paragraph, last sentence, last word**

Changed “spirits” to “spirit(s).”

### **Chapter 4, Eliminating Teleonomic Theories, eighth paragraph, first sentence**

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“The problem with this world-view is that we live in a material world, **not a world constructed entirely of our beliefs.**”

changed to:

“The problem with this world-view is that we live in a material world.”

### **Chapter 4, Eliminating Teleonomic Theories, end**

Added the paragraph:

“We are complex adaptive beings living in a complex adaptive world. We should beware of simple theories that claim to explain causation.”

### **Chapter 4, Summary, first paragraph, first two sentences**

“This chapter proposed pragmatic means of eliminating **unethical and simplistic** teleonomic theories.<sup>++</sup> **What remains is** a set of theories that deserve our tolerance.”

changed to:

“This chapter proposed **accepting Schweitzer’s reverence for life as the ultimate normative end of life. It then used this guiding principle to develop** pragmatic means of eliminating teleonomic theories.<sup>++</sup> **Applying these means to the set of all teleonomic theories yields** a set of theories that deserve our tolerance.”

### **Chapter 6, Economic Turbulence, first paragraph, last sentence**

*“Unemployment and transient inflation are symptoms of economic turbulence.”*

changed to:

*“Transient inflation and unemployment are symptoms of economic turbulence.”*

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**Version 2002.06.13**

### **Preface, ninth paragraph, first three sentences**

“Traditional theories of ethics, politics, and economics ultimately rest on **a set of** unverifiable fundamental assumptions about human nature. **Finding a set that we can all agree on is impossible. Rather than founding a theory on a set of such** assumptions, I propose suspending a set of theories from a vague description of an ideal ultimate end.”



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was changed to:

“Traditional theories of ethics, politics, and economics ultimately rest on unverifiable fundamental assumptions about human nature. **Given that we will never be able to agree on these** assumptions, I propose suspending a set of theories from a vague description of an ideal ultimate end.”

## Chapter 1, Modern Economics’ Blind Spot, second paragraph, third sentence

Deleted “clearly.”

## Chapter 1, Efficiency and Effectiveness, third paragraph, fourth sentence

“Further, the inherent versatility of knowledge makes it impossible to predict with certainty how knowledge will be used: discoveries in one field often lead to discoveries in completely unrelated fields.”

was deleted.

## Chapter 1, Efficiency and Effectiveness, sixth paragraph, first sentence

“The distinction between **the established and proposed concepts of wealth and excellence in means** may be made clearer by thinking about the difference between how marginalist economists use ‘rationality’ and how we commonly use ‘wisdom.’”

was changed to:

“The distinction between **marginalist ‘efficiency’ and managerial ‘efficiency and effectiveness’** may be made clearer by thinking about the difference between how marginalist economists use ‘rationality’ and how we commonly use ‘wisdom.’”

## Chapter 2, Manufacturing Complexity, first paragraph, last sentence

“A simple production process has a single operation and so requires no links; a complicated one has more than one operation and no flexible links; and a complex one has at least one flexible link.”

was changed to:

“A simple production process has a single operation and so requires no links; a complicated one has more than one operation and no flexible links; and a complex one has **more than one operation and** at least one flexible link.”

## Chapter 2, Good People, first paragraph, first sentence

“The kaizen / **Total Quality Control (TQC)** adage, ...”

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was changed to:

“The kaizen adage, ...”

### Chapter 2, *Good People*, bullet list, last point

“Those with TQC programs that focus on customers’ needs provide their employees with meaningful work”

was changed to:

“Those with programs that focus on customers’ needs (e.g., Total Quality Control programs) provide their employees with meaningful work”

### Chapter 2, *A Dynamic Perspective*, first paragraph, third and fourth sentences

“This book tells the story of the life and travels of A. Square, a resident of the two-dimensional world of Flatland. Residents of Flatland have no concept of height, and so believe that ‘up’ is the same as ‘north’.”

was changed to:

“Abbott tells the story of the life and travels of A. Square, a resident of the two-dimensional world of Flatland. Residents of Flatland have no concept of height, and so believe that ‘up’ means the same as ‘north.’”

### Chapter 3, Introduction, second paragraph, last sentence

“Although Einstein’s theory of relativity provides more accurate answers than Newtonian dynamics, the latter is the more useful for plotting a spacecraft’s course because the slightly higher value of the former’s predictions is outweighed by the higher cost of using it.”

was changed to:

“Although Einstein’s theory of relativity provides more accurate answers than Newtonian dynamics, the latter is the more useful for plotting an artillery shell’s trajectory. The slightly higher value of the former’s predictions doesn’t justify the higher cost of using it.”

### Chapter 3, Introduction, fifth paragraph, second sentence

“It is possible to explain causation without being able to predict in the traditional (Newtonian) sense, as is the case in what physicists call *deterministic chaotic systems*.”

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was changed to:

“It is possible to explain causation without being able to predict in the traditional (Newtonian) sense, as is the case in *deterministic chaotic systems*.”

### Chapter 3, Introduction, fifth paragraph, last sentence

“Because we can never know initial conditions precisely, the best we can hope to predict much into the future is the general ‘climate’ as opposed to the specific ‘weather.’”

was changed to:

“Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the ‘weather.’ In the long term, the best we can hope to do is to predict the bounds of the trajectory, the ‘climate.’”

### Chapter 3, Introduction, seventh paragraph, last sentence

“From the static perspective of marginalist economics, predictions help us decide *how to get what we want* and explanations help us decide *what to want*.”

was deleted.

### Chapter 3, The Strategy for Choosing Economic Explanations, last paragraph

Inserted the paragraph:

“Contrary to modern Austrian doctrine, we can think in terms of what we need to achieve our ultimate ends even when we only have a rough idea of what our ultimate ends are and what we need to achieve them.”

### Chapter 4, Eliminating Teleonomic Theories, second paragraph, second sentence

“Maslow’s hierarchy of needs suggests a method of discovering misleading theories. Again, he discovered needs by investigating the causes of distress and illness. What he found naturally fell into three categories, physical needs, mental needs, and spiritual needs. These three types of needs emerge on at least two levels of abstraction. Our physical needs emerge at the molecular level. For example, our need for oxygen, water, and nutrition arise from our molecular processes’ need for oxygen, water, and nutrition. In contrast, our mental needs arise from our minds, not from the molecular processes of our brain cells. Molecular processes have no need for love or self-respect. Arguably, our spiritual needs emerge at an even higher level of abstraction than our mental needs.”

changed to:

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“The fact that Maslow’s becoming needs fall into two categories, physical needs and mental needs, suggests a method of discovering misleading theories. These two types of needs emerge at different levels of abstraction. Our physical needs emerge at the molecular level. For example, our need for oxygen, water, and nutrition arise from our molecular processes’ need for oxygen, water, and nutrition. In contrast, our mental needs arise from our minds, not from the molecular processes of our brain cells. The molecular processes of our brain cells have no need for love or self-respect.”

### Chapter 7, Introduction, first paragraph, first sentence

“From the recursionist perspective put forth in this work, the normative end of government is promoting progress by administering justice, which is a matter of continuously improving the quality of decision-making.”

was changed to:

“The normative end of government is administering justice. From the recursionist perspective put forth in this work, administering justice is a matter of continuously improving the quality of decision-making.”

### Chapter 7, Consider Incentives and Enforcement Costs, second paragraph, last sentence

*“Excellence in governing concerns the justice of government interventions into private affairs, not the justice of those affairs.”*

was deleted.

### Chapter 7, Consider Incentives and Enforcement Costs, third paragraph, first sentence

“Many factors make judging the interventions of governments difficult.”

was changed to:

“Many factors make judging the interventions of governments difficult:”

### Chapter 7, Consider Incentives and Enforcement Costs, third paragraph, last sentence

“We know as little about how human cultures evolve and what effect government interventions have on this evolution as we do about how ecosystems evolve and what effect human interventions have on these systems.”

was deleted.

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### Chapter 7, *Consider Incentives and Enforcement Costs*, last paragraph, second and third sentences

“Public choice economics provides insights into the dynamics of how governments actually work and the field of ‘law and economics’ provides insights into the cost of enforcing laws. The emerging science of complex dynamic systems may eventually provide us with the (positive) transaction cost theory that Ronald Coase called for in his Nobel lecture.”

was changed to:

“Public choice economics provides insights into the dynamics of how governments actually work and the field of law and economics provides insights into the cost of enforcing laws. The emerging science of complex dynamic systems may eventually provide us with the transaction cost theory that Ronald Coase called for in his Nobel lecture.”

### Chapter 7, *Lucid Culture*, second paragraph, second sentence

“We can see this trend clearly in England, the first country to industrialize, where over the course of four hundred years, the organizing principle of the predominant culture shifted from the medieval ideal of fulfilling one’s role in God’s plan to a crassly hedonistic version of Jeremy Bentham’s ideal of “the greatest good for the greatest number.”

was changed to:

“We can see this trend clearly in England, the first country to industrialize, where the organizing principle of the predominant culture gradually shifted from the medieval ideal of fulfilling one’s role in God’s plan to a crassly hedonistic version of Jeremy Bentham’s ideal of “the greatest good for the greatest number.”

### Chapter 7, *Lucid Culture*, sixth paragraph, third sentence

Deleted “(Marxist).”

### Chapter 7, *Conclusion*, second paragraph, last sentence

“However, the case for decentralization itself depends on the assumption that we seek to live wisely.”

was italicized.

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### Preface, fourth paragraph, first sentence

“**Focusing on** the scarcity of knowledge creates **a** problem for economists.”

was changed to:

“**Recognizing** the scarcity of knowledge creates **an immediate** problem for **modern** economists.”

### Preface, fourth paragraph, last six sentences

“**Most economists have chosen to stay with closed-ended models. In effect, they have chosen to ignore the possibility of solving economic problems by creating knowledge. To think clearly about information age economies, economies in which the primary means of progress is the creation of knowledge, we need a theory that encompasses the creation of knowledge. We need an economics of knowledge. Because wisdom is a form of knowledge, an adequate economics of knowledge must be based not on what people will do, but on what the wise would do. This is not only a radical departure from modern economics but also a radical departure from what modern economists deem to be science.**”

was changed to:

“**Recognizing the scarcity of knowledge also creates a deeper problem for modern economists. Wisdom is a form of knowledge. Economic theories that consider wisdom must be based not on what people will do, but on what the wise would do. This is beyond the pale of what modern economists deem to be science. Most economists have chosen to stay with closed-ended models based on what people will do. In effect, they have chosen to ignore the possibility of solving economic problems by creating knowledge.**”

### Preface, fifth paragraph, first sentence

“The **source** of **modern economics’** problem goes back to Adam Smith, the grandfather of modern economics.”

was changed to:

“The **root** of **these** problems goes back to Adam Smith, the grandfather of modern economics.”

### Preface, sixth paragraph, last sentence

“Regrettably, economists are right when they say that a rigorous theory that reconciles **these two**, a precise theory that aims at progress rather than growth, is beyond our grasp.”

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was changed to:

“We need a theory of economics that encompasses the creation of knowledge, including the knowledge of how to act wisely. Regrettably, economists are right when they say that a rigorous theory that reconciles ethics and modern economics, a precise theory that aims at progress rather than growth, is beyond our grasp.”

## Chapter 4, Introduction, first paragraph, first sentence, footnote

Added the following paragraph:

“Teleonomic theories are both positive and normative. As David Hume observed, one cannot produce a normative statement from a string of positive ones. The implicit normative statement in teleonomic theories is that we *owe* it to ourselves to follow our internal programming. In other words, we *ought* to live good lives. For more on this topic, read part two of Mortimer Adler’s book, *Ten Philosophical Mistakes*.”

## Chapter 4, Secular Humanist Ultimate Ends, sixth paragraph, first sentence

“Each of us has a structure (system) of beliefs (ideas/knowledge). Some of our beliefs are critical to this structure.”

Added the following paragraph:

“Each of us has a belief system, a structure of articulate knowledge. Some of our beliefs are critical to this system.”

## Chapter 4, Summary, first paragraph, second sentence, footnote

Deleted the footnote:

“Teleonomic theories are *descriptions*. Adding the *prescription* that we ought to fulfill our internal programs wisely, that is, pursue happiness, changes these positive theories into normative ones. Because our internal programming includes programming to fulfill our programming, the statement that we ought to fulfill our programming (pursue happiness) is positive as well as normative. For more on this apparent contradiction of David Hume’s dictum as well as on the nature of happiness, read part two of Mortimer Adler’s book, *Ten Philosophical Mistakes*.”

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## Chapter 1, Introduction, fourth paragraph, last sentence

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“A generation later, Alfred Marshall used these marginalist concepts to develop a toolbox of models **to analyze markets after they have been shocked by change. Every student of microeconomics recognizes these partial equilibrium models as the familiar supply and demand curves of comparative static analysis.**”

was changed to:

“A generation later, Alfred Marshall used these marginalist concepts to develop a toolbox of **partial equilibrium** models **for predicting the effects of external shocks on markets.**”

### **Chapter 4, Secular Humanist Ends, fourth paragraph, last sentence**

Changed “ill-defined needs” to “illusive needs.”

### **Chapter 4, Eliminating Simplistic Theories, last two paragraphs**

“Trinitarianism provides an explanation of altruism in its least selfish form. However, it fails to consider a usefully complete range of human motivations and so too often fails to find the most effective problem to solve. This lesson applies to other theories as well. We should reject the theories of Sigmund Freud, which focuses on procreation, and of Alfred Adler, which focuses on power. This does not mean that we should reject more complex theories that incorporate elements of these two theories.

“We are complex adaptive beings living in a complex adaptive world. We should beware of simple theories that claim to explain causation.”

was changed to:

“This example of misguided charity illustrates why we need theories that help us identify *all* of our needs. Theories that seek to explain our needs based on a single level of abstraction, such as the selfish gene theory, positive rights postmodernism, and naïve Trinitarianism, only help us identify *some* of our needs. We owe it to ourselves to eliminate teleonomic theories that consider only a single level of abstraction.”

### **Chapter 4, Summary, last sentence**

“This tolerance is based on our incomplete knowledge of our ultimate ends and of the best means to them, **rather than on the presumed right to do as we please.**”

was changed to:

“This tolerance is based, **not on the presumed right to do as we please, but** on our incomplete knowledge of our ultimate ends and of the best means to them.”



## Version 2002.07.11

### Chapter 1, Overview, fourth sentence

Deleted “(‘muddle-headed’)” and “(‘simple-minded’).”

### Chapter 4, Eliminating Teleonomic Theories, heading

Changed “Teleonomic” to “Simplistic.”

### Chapter 4, Eliminating Simplistic Theories, second paragraph, first two sentences

“The fact that Maslow’s becoming needs fall into two categories, physical needs and mental needs, suggests a method of discovering misleading theories. These two types of needs emerge at different levels of abstraction.”

was changed to:

“Our needs are complex in that they at more than one level of abstraction. Consider our physical needs and mental needs.”

### Chapter 6, A Simple (Simplistic?) Model of Progress and Turbulence, heading

Deleted “(Simplistic?)”

### Chapter 6, A Simple Model of Progress and Turbulence, first paragraph

“We can imagine a freely evolving economy consisting of people seeking happiness. Given that these people tend to implement better means whenever they are not busy responding to turbulence, the level of turbulence will tend toward a critical value. If a catastrophe increases the level of turbulence past the critical value, they will spend less time (and other resources) implementing better means and more responding to turbulence, which tends to return the level of turbulence to the critical value. On the other hand, if they make exceptionally good decisions, they will have more time (and other resources) to implement better means, which creates turbulence. Again, the level of turbulence tends to return to the critical value.”

was changed to:

“Imagine an economy filled with free and wise people pursuing happiness. Given that people pursuing happiness seek to find and implement better means whenever they have the resources to do so, the level of turbulence economy will tend toward a critical value. When turbulence exceeds the critical value, people will be forced to spend more resources, particularly time, responding to turbulence. This will leave them fewer

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resources for finding and implementing better means. The resulting decrease in new means will eventually decrease turbulence. On the other hand, when turbulence falls below the critical value, people will have more resources for finding and implementing better means. The resulting increase in new means will eventually increase turbulence. In both cases, the level of turbulence tends to return to the critical value.”

### Chapter 6, A Simple Model of Progress and Turbulence, second paragraph

“In reality, we are neither completely free to pursue happiness nor wise enough to do so. Relaxing the assumptions that people are both free and wise enough to pursue happiness lowers the quality of decision-making. This has opposing effects on the level of turbulence. On the one hand, it tends to slow the rate of progress, which lowers the level of turbulence. On the other, it tends to increase economic viscosity, which raises the level of turbulence for a given rate of progress. The overall effect of lowering the quality of decision-making on the level of turbulence is unclear. The only thing that is clear is that lowering the quality of decision-making slows progress and wastes resources.”

was deleted.

### Chapter 6, A Simple Model of Progress and Turbulence, last paragraph, first sentence

Changed “simple” to “weakly chaotic.”

### Chapter 6, A Simple Model of Progress and Turbulence, last paragraph, last two sentences

“It tells us to beware of policies that address the symptoms of economic turbulence (unemployment and transient inflation) rather than its cause (poor decision making). When such policies lower the quality of decision-making, they retard progress.”

changed to:

“It tells us to focus on the cause of economic turbulence, poor decision-making, rather than on its symptoms, transient inflation and unemployment. When policies meant to treat the symptoms lower the quality of decision-making, they retard progress.”

### Chapter 6, A Simple Model of Progress and Turbulence, last paragraph, third sentence

Inserted the following footnote:

“This model predicts a chaotic phase space trajectory that creates what appears to be (but isn't) an exploitable trade-off between transient inflation and unemployment (a

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Phillips curve). It also predicts that economic avalanches will follow a power law. Note that these two predictions are based on assumption that people pursue happiness. Violating this assumption has two opposing effects on the level of turbulence. On the one hand, it tends to slow the rate of progress, which lowers the level of turbulence. On the other, it tends to increase economic viscosity, which raises the level of turbulence for a given rate of progress. The overall effect is to make the system less weakly chaotic, hence less predictable.”

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## Version 2002.07.18

### Chapter 1, Introduction, second paragraph, fourth sentence

Changed “warrant” to “justify.”

### Chapter 6, Economic Viscosity, last paragraph

“In a competitive market, individuals and managers experiment with new decision-making methods. In the long run, the best methods are emulated and the worst are discarded. **Because of this, competitive** economies tend to become **ever** more fluid.”

was changed to:

“In **freely evolving economies**, individuals and managers experiment with new decision-making methods. In the long run, the best methods are emulated and the worst are discarded. **Thus, freely evolving** economies tend to become more fluid **over time**.”

### Chapter 7, Introduction, first paragraph

“The normative end of government is administering justice. From the recursionist perspective put forth in this work, administering justice is a matter of continuously improving the quality of decision-making. To do this well, governments must have a **learning** strategy to help decide who makes what decisions under what incentives. What constitutes a good **learning** strategy? This chapter considers several factors: **freedom**, moral vision, just taxation, and lucid culture.”

was changed to:

“The normative end of government is administering justice. From the recursionist perspective put forth in this work, **government policy makers administer justice by deciding who makes what decisions under what incentives. Excellence in** administering justice is a matter of continuously improving the quality of decision-making. What constitutes a good strategy **for deciding who makes what decisions under what incentives, one that continuously improves the quality of decision-making?**”

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This chapter considers several factors: **decentralization**, moral vision, just taxation, and lucid culture.”

### Chapter 7, Freedom, heading

The heading was changed from “Freedom” to “Decentralization”

### Chapter 7, Decentralization, first paragraph

“**The JIT example highlighted the benefits of decentralized decision-making.** The following **describes three** prescriptions for decentralizing decision-making.”

was changed to:

“**Learning how to progress toward our ultimate ends ever more wisely, like learning how to manufacture batches of different goods ever more efficiently, is an infinitely large, amorphous problem. Such problems yield more readily to many average minds acting in unison than to a few exceptional minds directing many hands.** The following **provides two** prescriptions for decentralizing decision-making **wisely.**”

### Chapter 7, Consider Incentives and Enforcement Costs, first paragraph, third sentence

“(authoritarian in **regard to** means, progressive in **regard to** ends)”

was changed to:

“(authoritarian in means, progressive in ends)”

### Chapter 7, Consider Incentives and Enforcement Costs, third paragraph, last sentence

Inserted the following footnote (which was the last paragraph of this section):

“Regrettably, we currently have no theory that captures enough of reality to provide us with cookbook judgments about government intervention. *Public choice economics* provides insights into the dynamics of how governments actually work and the field of *law and economics* provides insights into the cost of enforcing laws. The emerging science of complex dynamic systems may eventually provide us with the transaction cost theory that Ronald Coase called for in his Nobel lecture. Until computer simulation provides us with such a tool, judging government interventions will remain more art than engineering.”

### Chapter 7, Consider Incentives and Enforcement Costs, second to last paragraph, second sentence

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“As public choice economist Mancur Olson observed, those that benefit from such interventions will **vigorously oppose changing or eliminating it.**”

was changed to:

“As public choice economist Mancur Olson observed, **this makes them nearly impossible to rescind.**”

### **Chapter 7, Consider Incentives and Enforcement Costs, second to last paragraph, end of third sentence**

Inserted the footnote:

“Popular solutions to this problem of democratic governance include limiting terms in office, campaign contributions, and campaign expenditures. None of these solutions addresses the fundamental problem, which is public ignorance and apathy. The surest solution involves creating a culture that considers creating or maintaining programs and policies that benefit special interests at the expense of the general public and future generations to be as evil as dumping toxic industrial waste down storm sewers. Given such a culture, the problem becomes one of exposing those who create or maintain these barriers to progress.”

### **Chapter 7, Consider Incentives and Enforcement Costs, second to last paragraph, last sentence**

“Given that **any intervention by government tends to become permanent**, prudence demands that **the burden of proof as to whether an intervention is just or unjust should fall on the government.**”

was changed to:

“Given that **unjust government interventions are nearly impossible to rescind**, prudence demands that **policy makers err on the side of not intervening.**”

### **Chapter 7, Consider Incentives and Enforcement Costs, last paragraph**

This paragraph was converted to footnote, which was placed at the end of the third paragraph. (See above.)

### **Chapter 7, Eliminate Barriers to Progress**

This section was deleted. Parts were used to create the new footnote at the end of the previous section. (See above.)

### **Chapter 7, Moral Vision, second paragraph, fourth and fifth sentences**

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“The higher we are in this hierarchy, the more we need a vision to help us **understand** what **we currently need**. Second, as we accumulate **wealth**, the pace of change tends to increase, which makes following the virtuous path of accumulating wealth and accelerating change more difficult.”

was changed to:

“The higher we are in this hierarchy, the more we need a vision to help us **know** what **to do**. Second, as we accumulate **useful knowledge**, the pace of change tends to increase, which makes following the virtuous path of accumulating wealth and accelerating change more difficult.”

### Chapter 7, Moral Vision, third paragraph

“Note that a moral vision is not the same as moral values. Where the former recognizes our ignorance, the latter does not. The failure to distinguish between these two has led some famous liberals and progressives to recommend conservative actions. Both liberal Thomas Jefferson and progressive Theodore Roosevelt feared that the accumulation of material wealth would destroy American virtue. Their prescription was a set of behaviors meant to impart the “right” moral values. For Jefferson this was the life of a gentleman farmer and for Roosevelt it was a periodic return to the vigorous outdoor life of America’s frontier past. Both were blind to the possibility of discovering values and behaviors that help us satisfy our needs better than existing ones do. In information age economies, what matters most is not values and behaviors, but vision and concepts.”

was converted to a footnote.

### Chapter 7, Just Taxation, first paragraph

“All forms of taxation disrupt **markets**. Just forms disrupt **markets** in ways that promote progress.”

was changed to:

“All forms of taxation disrupt **the coordination of decision-making**. Just forms disrupt **it** in ways that promote progress.”

### Chapter 7, Just Taxation, second paragraph, last sentence

“Over time, **lowering the demand** for oil **and providing an example of inducing new knowledge** will reduce the risk of war over oil.”

was changed to:

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“Over time, **inducing such knowledge** will reduce the risk of war over oil **and other scarce resources.**”

### Chapter 7, Lucid Culture, first paragraph, first and second sentences

“All cultures are mixtures of lucidity, passion, and dark inertia, **where lucidity concerns the pursuit of happiness, passion concerns the pursuit of pleasure, and dark inertia concerns the pursuit of nothing.** Given the **reasonableness** of pursuing happiness, we might expect there to be a trend toward lucidity.”

were replaced by the following footnote in the next sentence:

“All cultures are mixtures of lucidity, passion, and dark inertia. **When lucidity prevails, we pursue happiness; when passion prevails, we pursue pleasure; and when dark inertia prevails, we pursue nothing.** Given the **wisdom** of pursuing happiness, we might expect there to be a trend toward lucidity.”

### Chapter 7, Lucid Culture, eighth paragraph, second and third sentences

“Given that economies are complex recursive systems, this question is simply a variation of our original question of what is the best learning decision strategy. Nevertheless, it is a useful one to ask in that it focuses our attention on relationships.”

were replaced by the following footnote in the next sentence:

“Delving deeper returns us to our original question, what is the best learning strategy?”

### Chapter 7, Lucid Culture, ninth paragraph, first sentence

“Near the top of the list of barriers to free association...”

was changed to:

“A good example of such a barrier in the United States...”

### Afterword, fourth to the last paragraph

“As a practical matter, liberals and conservatives can talk to, rather than past, each other by adhering to two principles. The first is to recognize the normative end of reverence for life. The second is to use the broadest definition of the problem for which there is empirical evidence. In the commuter airlines example, this would likely be whether the proposal to regulate commuter airlines like major airlines would actually save lives.”

was deleted.

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### Chapter 1, Introduction, heading

“Introduction”

was changed to:

“Concepts of Wealth”

### Chapter 1, Concepts of Wealth, first paragraph, third sentence

“They belong to the class of resources that are **forms**, patterns of matter, energy, space, and time. We can think of this class **of resources** as **useful knowledge**.”

was changed to:

“They belong to the class of resources that are patterns of matter, energy, space, and time. We can think of this class as *knowledge resources*.”

### Chapter 1, Concepts of Wealth, first paragraph, last two sentences

“**Useful knowledge** resources differ from **non-knowledge scarce** resources in a fundamental way: *although they can be costly to create and to put into production, once in production, they are free.* \* **Once we put knowledge to use, we do not have to pay to do so again.**”

was moved to the beginning of a new paragraph and changed to:

“**Knowledge resources** differ from **other** resources in a fundamental way: *although they can be costly to create, to reproduce, and to place into production, once in production, they are free.* \* **Using a pattern does not exhaust it.**”

### Chapter 1, Concepts of Wealth, first footnote

“For both simplicity and to avoid debate over whether knowledge not yet in use is ‘scarce,’ all future references to ‘scarce resources’ will refer to non-knowledge scarce resources.”

was changed to:

“This work classifies resources into three categories: (1) scarce resources, (2) free resources, and (3) knowledge resources. Scarce resources are those that are costly to use. Free resources are those that are costless to use and costless to put into



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production. Knowledge resources are those that are costless to use but costly to put into production.”

### Chapter 1, Concepts of Wealth, new third paragraph, second through sixth sentences

“This great benefit comes at a cost. Because we do not have to pay to put to use knowledge already in use, knowledge in use has an advantage over otherwise superior knowledge not yet in use. For example, once a railroad company has laid its track, changing the distance between rails is very expensive. Rarely does the benefit of changing this distance justify doing so. Economists usually think of this effect, which economist Brian Arthur calls “lock-in,”<sup>1</sup> in terms of technology. However, it applies to all forms of useful knowledge, including concepts.”

was changed to:

“The inexhaustibility of knowledge gives knowledge in use an advantage over knowledge not yet in use. This advantage is equal to the cost of placing into service the pattern not yet in service. Consider the advantage that existing railroad track has over the same rails set on the same track bed at a slightly different distance between rails. This advantage is equal to the cost of resetting the pattern, in this case, the cost of resetting the rails. This *lock-in effect*<sup>+</sup> applies to all forms of useful knowledge, including concepts.”

### Chapter 1, Overview, third and fourth sentences

“The third proposes the strategy. The fourth takes a inclusive look at our ultimate ends and the fifth takes a discriminating look at the means to them.”

was changed to:

“The next three present the strategy. The third proposes the strategy, the fourth refines the set of ultimate ends that deserve our tolerance, and the fifth refines our understanding of excellence in means.”

### Chapter 4, title

“Ultimate Ends” was changed to “Refining Ultimate Ends.”

### Chapter 4, Reconciling Teleonomic Theories, second paragraph, first two sentences

“However, if we seek what is *useful*, we can reconcile these two logically incompatible belief systems. Materialists and dualists can agree on Schweitzer’s ultimate end of reverence for life.”

was appended to the first paragraph and changed to:

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“However, if we seek what is *useful*, we can reconcile these two logically incompatible belief systems **by finding a common ultimate end.**”

### **Chapter 4, Reconciling Teleonomic Theories, new second paragraph**

“As previously stated, strategic economic theories ought to concern what beings capable of using the knowledge that they create would do if they were wise. Is Schweitzer’s ultimate end of reverence for life wise? A thorough examination of this issue exceeds the bounds of this essay. In its place, the author offers his views of how Schweitzer’s reverence for life fits into secular and religious humanism, humanity’s materialist and dualist teleonomic traditions.”

was changed to:

“Humanity’s materialist and dualist teleonomic traditions are secular and religious humanism. The following two sections argue that secular and religious humanists can agree on Albert Schweitzer’s ultimate end of reverence for life.”

### **Chapter 4, Reconciling Teleonomic Theories, last paragraph**

“In addition to supporting the claim that reverence for life is wise, the following two sections introduce a number of useful concepts. These include the humanist definition of happiness, the need for “mystical oneness,” and normative (versus temporal) ends.”

was deleted.

### **Chapter 4, Eliminating Simplistic Theories, heading**

“Simplistic” was changed to “Teleonomic.”

### **Chapter 4, Eliminating Simplistic Theories, first paragraph**

“If we accept that reverence for life is wise, then we can develop two means of eliminating teleonomic theories. The first is simply to eliminate theories that are clearly incompatible with reverence for life. The most obvious examples are theories based on too narrow a conception of who ‘we’ are. The second is to eliminate misleadingly simple theories, theories that don’t yield the best problems for achieving the ultimate end of reverence for life.”

was changed to:

“If we can agree on the ultimate normative end of reverence for life, then we can develop rules for eliminating theories that don’t yield the best problems for achieving this end. An obvious rule is to eliminate theories that are based on too narrow a conception of who ‘we’ are. A less obvious rule is to eliminate theories that are based on a single level of abstraction.”

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## Chapter 4, Summary, last paragraph

“This chapter proposed accepting Schweitzer’s reverence for life as the ultimate normative end of life. It then used this guiding principle to develop pragmatic means of eliminating teleonomic theories. Applying these means to the set of all teleonomic theories yields a set of theories that deserve our tolerance. This tolerance is based, not on the presumed right to do as we please, but on our incomplete knowledge of our ultimate ends and of the best means to them.”

was changed to:

“This chapter proposed using humanism’s conceptual framework and highest ideal to refine the set of ultimate ends that deserve our tolerance. This process provides us with both a moral vision and a conceptual framework for thinking about our ultimate ends and the best means to them.”

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## Version 2002.07.28

### Preface, eighth paragraph

Changed “human nature” to “our nature” in the first and third sentences.

### Chapter 3, Introduction, second paragraph

Added new section titled “The Nature of Theories.”

### Chapter 3, The Nature of Theories

Moved paragraph starting with the sentence “*Theories are subjective.*” to the beginning of the section.

Moved last section, “Science as a Process,” forward, demoted it to subsection status, and changed the opening sentences from:

“The proposed strategy refines everyday thinking. This is consistent with Einstein’s conception of science:”

to:

“Einstein tells us that if we are to understand science, we need to analyze the nature of everyday thinking.”

### Chapter 3, The Nature of Theories, last paragraph, second sentence

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“To do so, we need (1) agreement about the general nature of our ultimate ends and (2) the means to measure how well explanations help us find problems to solve.”

was changed to:

“To do so, we need agreement about the general nature of our ultimate ends and the means to measure how well explanations help us find problems to solve.”

### **Chapter 3, The Nature of Theories, second paragraph, first sentence**

“Einstein tells us to analyze the process of everyday thinking.”

was deleted.

### **Chapter 3, The Strategy for Choosing Economic Explanations**

Changed the title to: “The Strategy for Progress.”

Inserted the following paragraphs at the beginning of the section:

“The last two decades of the twentieth century, Adam Smith’s vision of a beneficent self-organized system driven by individuals’ free pursuit of enlightened self-interest gained ground around the world. While proponents of this vision celebrated free markets, opponents patiently waited for the next crisis. That crisis arrived in the form of a series of scandals involving malfeasance in corporate governance, accounting, and investment banking in the United States.”

“Free market proponents and opponents interpret this malfeasance, this unenlightened decision-making, very differently. Proponents perceive it as a regrettable by-product of the process of improving the quality of decision-making. Opponents perceive it as a systemic problem that governments ought to eradicate.”

“The problem of unenlightened decision-making is made worse by economists’ failure to define enlightened self-interest adequately. To be enlightened is to be wise. We owe it to ourselves to act wisely. What do the wise want of life? What do the wise want of government?”

“The primary reason economists have failed to define enlightened self-interest adequately is that most limit economics to theories that predict. The notable exception is one small but increasingly influential group, the modern Austrian school of evolutionary economics.”

Polished balance of this section by eliminating sentences, rearranging paragraph breaks, and making a few small changes in wording.

### **Chapter 4, Introduction, third paragraph**

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“This chapter proposes a **pragmatic** means of reconciling materialist and dualist teleonomic theories. It then uses this reconciliation to develop means of **eliminating** teleonomic theories.”

was changed to:

“This chapter proposes a **practical** means of reconciling materialist and dualist teleonomic theories. It then uses this reconciliation to develop means of **refining the set of** teleonomic theories. **What remains are teleonomic theories that deserve our tolerance.**”

### Chapter 5, title

Changed “Excellence in Means” to “Increasing Excellence.”

### Chapter 5, Introduction, first sentence

“This chapter **outlines the** core theory of means.”

was changed to:

“This chapter **addresses deficiencies in modern Austrian economists’** core theory of means.”

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## Version 2002.08.15

### Preface, fourth paragraph

“Recognizing the scarcity of knowledge creates an immediate problem for modern economists. Knowledge resources differ from non-knowledge resources in that using them does not deplete them. The act of creating knowledge adds an infinite element into economic calculations that changes mathematically tractable closed-ended economic models into seemingly intractable open-ended ones. Recognizing the scarcity of knowledge also creates a deeper problem for modern economists. Wisdom is a form of knowledge. Economic theories that consider wisdom must be based not on *what people will do*, but on *what the wise would do*. This is beyond the pale of what modern economists deem to be science. Most economists have chosen to stay with closed-ended models based on what people will do. In effect, they have chosen to ignore the possibility of solving economic problems by creating knowledge.”

was deleted.

### Preface, new fourth paragraph, first sentence

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“The root of these problems goes back to Adam Smith, the grandfather of modern economics.”

was changed to:

“The person most responsible for this ‘Second Wave’ (industrial age) bias is Adam Smith, the grandfather of modern economics.”

### Preface, new tenth paragraph

“Further, I italicize the first use of unfamiliar terms.”

was changed to:

“I have also laid bare the essential arguments by eliminating much of the fluff that cushions conversational writing styles. I would rather have a few people understand the work than many misunderstand it.”

### Preface, last paragraph, last four sentences

“Theories that predict help us solve given problems. In contrast, I advocate a simple-minded theory that explains causation. Theories that explain causation, such as Darwin’s theory of evolution and Wegener’s theory of plate tectonics, help us find better problems to solve. My *strategic* theory that explains what happens in economies compliments *tactical* theories that predict what will happen in markets.”

was changed to:

“In contrast, I advocate simple-minded theories that explain causation. Theories that predict help us solve given problems. Theories that explain causation, such as Darwin’s theory of evolution and Wegener’s theory of plate tectonics, help us find better problems to solve. Wise decision-making requires performing both tasks well.”

### Chapter 1, Concepts of Wealth

Changed heading to “Modern Economics’ Key Concepts”

The fourth through seventh paragraphs were replaced by:

“All economic conceptual frameworks are founded on concepts that define the *end (goal) of economics* and *excellence in means*. In modern economics, these key concepts are the one hundred and thirty year old marginalist concepts of wealth and efficiency. The marginalist concept of wealth means consumer goods and the resources for producing them, where consumer goods are those goods and services that we buy to satisfy our wants and desires. The marginalist concept of efficiency means excellence in the the allocation of scarce resources at achieving a given end: the

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most efficient means to a given end is the one that uses the least valuable scarce resources.”

The old third footnote at the end of the section was added to the end of the fifth paragraph of the section now titled “Managerial Excellence in Means.”

### Chapter 1, Modern Economics' Blind Spot

Changed heading to “Marginalist Economics’ Blind Spot.”

### Chapter 1, Marginalist Economics' Blind Spot, second and third sentences

“... focuses our attention on **the allocation of** scarce resources. In doing so, it tends to blind us to the possibility of creating useful knowledge.”

was changed to:

“... focuses our attention on **how we allocate** scarce resources **to achieve given ends**. In doing so, it tends to blind us to the possibility of creating useful knowledge **and finding better ends**.”

### Chapter 1, Efficiency and Effectiveness

Changed heading to “Managerial Excellence in Means.”

### Chapter 1, Managerial Excellence in Means, second paragraph

“This managerial concept of excellence in means **recognizes that we can learn. Instead of thinking about excellence in means as efficiency, we can think about it as the managerial combination of efficiency and effectiveness.** Consider a 1993 decision **about whether to develop digital or analog “next generation” television. Digital television is more versatile, but more expensive. However, digital television technology is progressing down a much steeper learning curve. We can reasonably expect that** within a few years advances in digital technology **will** eliminate most of analog television’s cost advantage. The efficient choice is analog, but the efficient and effective choice **is** digital. Choosing the right problem to solve is as important as choosing the right solution to a given problem.”

was changed to:

“This managerial concept of excellence in means **permits learning. It also permits finding better problems to solve.** Consider **the late twentieth century problem of setting standards for the next generation of analog television. After considering the problem for decades, the Japanese settled on a high definition standard that used the same height to width aspect ratio as widescreen movies. A few years later, the Americans settled on a more versatile *digital* standard. At the time, digital television**

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was far more expensive than analog. However, **the Americans recognized that** digital television technology **was** progressing down a much steeper learning curve. Within a few years advances in digital technology **would** eliminate most of analog television's cost advantage. The 'efficient' choice **was** analog, but the 'efficient and effective' choice **was** digital. *By considering what they would do if they had more knowledge, the Americans found a better problem to solve.* Choosing the right problem to solve is as important as choosing the right solution to a given problem."

### Chapter 1, Managerial Excellence in Means, third paragraph, first sentence

"Changing our concept of excellence in means from "efficiency" to "efficiency and effectiveness" ..."

was changed to:

"Changing our concept of excellence in means from the marginalist concept of efficiency to the managerial concept of efficiency and effectiveness ..."

### Chapter 1, The Recursionist Approach, first paragraph, first sentence

"Changing our concept of excellence in means to "efficiency and effectiveness" ..."

was changed to:

"Changing our concept of excellence in means to **the managerial concept of** efficiency and effectiveness ..."

### Chapter 1, The Recursionist Approach, second paragraph, second sentence

"Decision scientists tell us that formal decision-making **processes** consist of **four basic operations**: (1) finding a problem to solve, (2) identifying alternative solutions **to the chosen problem**, (3) selecting an alternative, and (4) implementing the selected alternative."

was changed to:

"Decision scientists tell us that formal decision-making consists of (1) finding a problem to solve, (2) identifying alternative solutions, (3) selecting an alternative, and (4) implementing the selected alternative."

### Chapter 1, The Recursionist Approach, second paragraph, last two sentences

"Because we do not decide perfectly, this process wastes time and other resources. It is, as the English put it, a matter of "muddling through.""

was replaced by the former fourth paragraph:



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“Decision scientists tell us that formal decision-making processes consist of four basic operations: (1) finding a problem to solve, (2) identifying alternative solutions to the chosen problem, (3) selecting an alternative, and (4) implementing the selected alternative. Of course, not all decisions deserve the scarce resources necessary for formal decision-making. Less important decisions ought to be made by habit, standard procedure, or decision rules. The decision to employ these cheaper means for certain types of decisions is itself a decision, which often warrants formal deliberation.”

plus the following new paragraph

“We do not decide perfectly. Our mistakes waste time and other resources. However, *given a learning attitude*, we learn from our mistakes. *Given a learning attitude*, waste from imperfect decision-making is a regrettable by-product of learning through experience.”

### **Chapter 1, Managerial Excellence in Means, first paragraph, footnote, second sentence**

“The focus here is on the problems of individual economic agents.”

was changed to:

“The focus here is on the problems of individual economic agents, which includes the problem of what individuals owe to themselves to want of government.”

### **Chapter 1, Overview, fourth through sixth sentences**

“**The next three** present the strategy. **The third proposes strategy, the fourth refines the set of ultimate ends that deserve our tolerance, and the fifth refines our understanding of excellence in means.** The final two chapters discuss **macroeconomic issues.**”

was changed to:

“**Chapters three, four, and five** present the strategy. The final two chapters discuss **what modern economists call macroeconomic issues.**”

### **Chapter 3, The Strategy for Progress, first through fourth paragraphs**

“The last two decades of the twentieth century, Adam Smith’s vision of a beneficent self-organized system driven by individuals’ free pursuit of enlightened self-interest gained ground around the world. While proponents of this vision celebrated free markets, opponents patiently waited for the next crisis. Inevitably, opponents will find a suitable crisis. They need only wait for poor private sector decision-making to hurt a substantial number of people.”

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“Free market proponents and opponents interpret this malfeasance, this unenlightened decision-making, very differently. Proponents perceive it as a regrettable by-product of the process of improving the quality of decision-making. Opponents perceive it as a systemic problem that governments ought to eradicate.”

“The problem of unenlightened decision-making is made worse by economists’ failure to define enlightened self-interest adequately. To be enlightened is to be wise. We owe it to ourselves to act wisely. What do the wise want of life? What do the wise want of government?”

“The primary reason economists have failed to define enlightened self-interest adequately is that most limit economics to theories that predict. The notable exception is one small but increasingly influential group, the modern Austrian school of evolutionary economics.”

was changed to:

“The recursionist approach to economics aims at improving the quality of decision-making. Formal decision-making consists of (1) finding a problem to solve, (2) identifying alternative solutions, (3) selecting an alternative, and (4) implementing the selected alternative. To perform the first two tasks well, decision-makers need theories that explain causation based on what the wise would do. The economics profession fails to provide such theories.”

“Why has the economics profession failed to provide decision-makers with theories that explain causation based on what the wise would do? The major reason is that most schools of economics believe that the primary purpose of economic theories is to predict, not explain, the world. The notable exception is one small but increasingly influential school, the modern Austrian school of evolutionary economics.”

### **Chapter 3, The Strategy for Progress, new seventh and eighth paragraphs**

The seventh paragraph was converted into a footnote, which was placed at the end of the eighth paragraph. The reference to Ludwig von Mises and associated endnote was moved to the eighth paragraph. The opening sentence of the footnote was changed slightly. The last sentence of the footnote was deleted.

### **Chapter 5, Increasing Excellence**

Changed title back to “Excellence in Means.”

### **Chapter 5, second footnote**

Eliminated all quotation marks.

### **Chapter 6, Introduction, third paragraph, first sentence**

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“This little thought experiment exposes the foolishness at the heart of **modern** macroeconomics.”

was changed to:

“This little thought experiment exposes the foolishness at the heart of macroeconomics.”

### Chapter 7, Just Taxation, second paragraph, last sentence

Added the footnote:

“There are two major issues to consider. The first is whether we can trust policy makers to act justly. The second is whether policy makers have enough knowledge to act justly. Given the practical impossibility of ridding ourselves of unjust government policies, it is better to err on the side of caution.”

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### Preface, last three paragraphs

“**Alfred North Whitehead** once remarked that his friend and collaborator, **Bertrand Russell**, always focused on what was of primary importance, while he tried to make sense of complexity: “You know, there are two sorts of people in the world, the muddle-headed and the simple-minded. You, Bertie, are simple-minded; I am muddle-headed.”

“**I am muddle-headed in my pursuit of the truth (per se), but simple-minded in my pursuit of the useful.** Economies are more complex than we can possibly imagine. Over time, small events, including small changes in beliefs, can have huge consequences. Capturing this complexity in its entirety is far beyond our mental abilities. The best we can do is to capture what is most useful for the task at hand.”

“This instrumental approach to economics is not new – Milton Friedman took it in his 1953 essay, “The Methodology of Positive Economics.” In this most cited economics paper, Friedman advocates **what Whitehead would call “simple-minded”** theories that predict. In contrast, I advocate **simple-minded** theories that explain causation. Theories that predict help us solve given problems. Theories that explain causation, such as Darwin’s theory of evolution and Wegener’s theory of plate tectonics, help us find better problems to solve. Wise decision-making requires performing both tasks well.”

was changed to:

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“Economies are more complex than we can possibly imagine. Over time, small events, including small changes in beliefs, can have huge consequences. Capturing this complexity in its entirety is far beyond our mental abilities. The best we can do is to capture what is most useful for the task at hand.”

“This instrumental approach to economics is not new – Milton Friedman took it in his 1953 essay, “The Methodology of Positive Economics.” In this most cited economics paper, Friedman advocates theories that predict. In contrast, I advocate theories that explain causation. Theories that predict help us solve given problems. Theories that explain causation, such as Darwin’s theory of evolution and Wegener’s theory of plate tectonics, help us find better problems to solve. Wise decision-making requires performing both tasks well.”

## **Chapter 1, Modern Economics’ Key Concepts**

Changed heading to “Conceptual Resources.”

Moved fourth paragraph to next section.

## **Chapter 1, Marginalist Economics’ Blind Spot**

Changed heading to “Modern Economics’ Blind Spot.”

## **Chapter 1, Modern Economics’ Blind Spot, new second paragraph, third sentence**

“In doing so, it tends to blind us to the possibility of **creating useful knowledge and finding better ends.**”

was changed to:

“In doing so, it tends to blind us to the possibility of finding better ends, **particularly those that involve creating useful knowledge.**”

## **Chapter 4, Introduction, footnote, first paragraph**

Inserted the paragraph:

“The rationale for using teleonomic theories is that we, like all other biological organisms, are motivated by internal programming. This is not to say that our programming works the same as that of other organisms. To say that it does is to deny the emergence of higher level phenomena such as human consciousness.”

## **Chapter 5, Title and Section Headings**

“Excellence in Means” was changed back to “Increasing Excellence.”

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“Excellence in Consumption” was changed to “Consumption.”

“Excellence in Trade” was changed to “Trade.”

“Excellence in Production” was changed to “Production Technology.”

### **Chapter 5, Introduction, first paragraph**

“This chapter addresses deficiencies in modern Austrian economics’ core theory of means. It begins with an outline of excellence in consumption, which describes the pursuit of happiness. Next is an outline of excellence of trade, which emphasizes current misconceptions about trade. Following that is a brief discussion of excellence in production, which emphasizes the complex relationships between excellence in production, trade, and consumption. The chapter ends with a reminder that the focus of recursionist economics is on processes rather than states of the world and on individuals rather than organizations.”

was changed to:

“Increasing excellence in means is a matter of substituting knowledge for non-knowledge resources in progressing toward our ultimate ends. This can be a matter of choosing better means to a given subordinate end. It can also be a matter of choosing better subordinate ends.

“Some concepts derived from marginalist economics tend to blind us to better means and subordinate ends. This chapter proposes alternatives to four of these concepts: consumption, trade, production technology, and profit. To paraphrase Mark Twain, ‘It ain’t what you don’t know that gets you into trouble. It’s what you know for sure that just ain’t *useful*.’”

### **Chapter 5, Consumption, first paragraph, first sentence**

“**Recursionist economics’** humanistic ethics differs markedly from utilitarianism, **the ethical base of the marginalist economics.**”

was changed to:

“**The marginalist concept of consumption is loosely based on Jeremy Bentham’s utilitarian ethics. In contrast, the recursionist concept is based on a loose amalgam of humanistic ethical theories. Humanistic ethics differs markedly from utilitarianism. Humanistic ethics differs markedly from utilitarianism.**”

### **Chapter 5, *The Effect of the Information Revolution*, entire section including references**

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“Market forces create incentives to lower trading relationship costs. In rapidly changing economies, these forces tend to lower fixed trading costs as well as marginal ones. In 1932, economist Ronald Coase observed that firms would expand until the costs of doing business within the firm equaled those of doing business outside the firm.<sup>19</sup> Coase’s insight allows us to imagine what the world would be like if the fixed costs of establishing, maintaining, and ending low variable cost trading relationships fell to zero. In such a world, there would be no distinction between activity inside and outside firms. Everyone in the private sector would be a subcontractor to a single, continuously reorganizing, internally competitive, horrendously complex virtual firm. It is toward this end that the knowledge intensive segments of economies are being driven. Examples of such fluid organization include Hollywood, Wall Street, and the Silicon Valley.”<sup>+</sup>”

“<sup>19</sup> Coase, Ronald, “The Institutional Structure of Production”, 1991 Alfred Nobel Memorial Prize Lecture in Economic Sciences, reprinted in *Essays on Economics and Economists* (Chicago: University of Chicago Press, 1994).”

“<sup>+</sup> From the marginalist perspective, understanding the complex adaptive process that leads toward this end is problematic. As logical time horizons shrink, the long-term strategic issue of what assets to own encroaches on the short-term tactical issue of how to best manage currently owned assets. When the extraordinary activity of redeploying assets becomes ordinary, firms are no longer firm, which makes studying the ordinary behavior of firms very difficult. From the recursionist view, the focus is on decision-making rather than on how firms allocate scarce resources. The fact that firms are no longer firm is not a problem.”

were deleted.

### Chapter 5, Production Technology, first paragraph, first two sentences

“Production technology is not simply something that comes out of a research and development lab or manufacturing engineering department. As the rapid tool-setting example showed, a well designed and implemented production process can produce both product and the knowledge of how to improve the production process.”

was changed to:

“Production technology is the knowledge of how to produce a product. As the rapid tool-setting example showed, a well designed and implemented production process can produce both product and production technology.”

### Chapter 6, Introduction, second paragraph, fourth sentence

“Economists would record an immediate fall in aggregate production and rise in unemployment and inflation.”

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was changed to:

“Economists would record an immediate fall in aggregate production and rise in unemployment. **Consumer prices would also rise as resources formerly used to produce consumer goods are diverted to the reallocation process.**”

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**Version 2002.08.22**

## **Preface, second paragraph**

Inserted the paragraph

“Modern economic science focuses on the allocation of scarce resources. In doing so, it ignores the process of creating useful knowledge. Equally important, its theory of consumption ignores knowledge of how to live wisely. Arguably, these are the two most important aspects of information age economies.”

## **Preface, new third paragraph**

“In a **widely discussed** article published in the February 1997 issue of *The Atlantic Monthly*, **billionaire speculator George** Soros wrote that the main threat to an open society no longer comes from communism but from capitalism. **Soros** fears that we place too much faith in laissez-faire economic theories. **He** calls for a conceptual framework that recognizes our fallibility. **In economic terms, he calls for explicitly recognizing the scarcity of knowledge as well as non-knowledge resources.**”

was changed to:

“**Billionaire speculator George Soros believes that the threat posed by modern economic science is dire.** In an article published in the February 1997 issue of *The Atlantic Monthly* **titled *The Capitalist Threat***, Soros wrote that the main threat to an open society no longer comes from communism but from capitalism. **He** fears that we place too much faith in laissez-faire economic theories. **To counteract this, he** calls for a conceptual framework that recognizes our fallibility.”

## **Preface, new fourth paragraph, first sentence**

“**Futurists Alvin and Heidi Toffler see the failure of modern economic theories** to consider knowledge adequately more of a missed opportunity than a threat.”

was changed to:

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“Futurists Alvin and Heidi Toffler **are less alarmed**. **They** see modern economic **science’s** failure to consider knowledge adequately more of a missed opportunity than a threat.”

### **Preface, new fifth paragraph, first sentence**

Changed “... modern economics” to “... modern economic **science**.”

### **Preface, new sixth paragraph, fifth sentence**

Changed “knowledge of how to **act** wisely” to “knowledge of how to **live** wisely.”

### **Preface, new eighth paragraph**

“Traditional theories of ethics, politics, and economics ultimately rest on unverifiable fundamental assumptions about our nature. Given that we will never be able to agree on these assumptions, I propose suspending a set of theories from a vague description of an ideal ultimate end. As we discover more about our nature, we can eliminate members of this set. This approach works regardless of our current beliefs. Think of how hikers climb a hill. Regardless of where they begin, they can find their way to the top by heading toward it.”

was deleted.

### **Preface, new eighth paragraph, first sentence**

“An immediate benefit of this **convergence** strategy is that it provides us with a strategic world-view and related conceptual framework that can help us find the better tactical problems to solve.”

was changed to:

“An immediate benefit of this strategy is that it provides us with a strategic world-view and related conceptual framework that can help us find the better tactical problems to solve”

### **Chapter 1, The Recursionist Approach, title**

“The Recursionist Approach” was changed to “The Recursionist Strategy.”

### **Chapter 1, Recursionist Economics, fifth paragraph, first sentence**

“The recursionist **approach** aims at improving decision-making by improving the factors of good decision-making.”

was changed to:



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“The recursionist **strategy** aims at improving decision-making by improving the factors of good decision-making.”

### Chapter 3, The Strategy for Progress, title

“The Strategy for Progress” was changed to “A New Foundation for Explanation.”

### Chapter 3, A New Foundation for Explanation, first paragraph, first sentence

“The recursionist approach to economics...” was changed to “The recursionist strategy....”

### Chapter 3, A New Foundation for Explanation, last three paragraphs

“The subject of how we turn knowledge and scarce resources into progress toward our ultimate ends is the metaphysical equivalent of quicksand. Fortunately, Einstein has given us a rope in the form of his philosophy of knowledge, which recognizes that we form concepts by means of the “free inventions of the human intellect” (intuition) rather than reason.<sup>7</sup> If we can agree on an ultimate end, we can use Einstein’s rope to pull ourselves across this quagmire.

“At first glance, it may seem that this suggestion is of little use in that there appears to be no ultimate end strong enough to support us. Agreeing on an ultimate end is at least as difficult as agreeing on a foundation of metaphysical assumptions about our nature. However, we can choose to define a *set of ultimate ends*, which provides more support than any one such end. We can then formulate a theory of means that is common to all members of this set. This strategy has two advantages. First, it allows us to avoid most of the metaphysical problems associated with defining a single ultimate end. Second, it makes the problem of defining ultimate ends part of the economic problem that we must solve. As we learn more, we can eliminate members of this set without having to change our core theory of means.

“Contrary to modern Austrian doctrine, we can think in terms of what we need to achieve our ultimate ends even when we only have a rough idea of what our ultimate ends are and what we need to achieve them.”

were changed to:

“We can correct this deficiency by replacing modern Austrian economics’ marginalist foundation with an evolutionary one. To do so, the explanations that we use to help us satisfy our needs and the explanations that we use to define our needs must both fit together and work together. We can insure that these two types of explanations fit together by defining our needs and ultimate ends tautologically: *our needs are those things we need to progress toward our ultimate ends and our ultimate ends are what we progress toward when we satisfy our needs*. We can insure they work together by assuming that we are motivated to satisfy our needs. *Teleonomic theories*, theories that

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look to an internal program or programs to explain what motivates us, satisfy both of these conditions.<sup>7</sup>

“Modern biology provides the rationale for using teleonomic theories as the foundation for evolutionary explanations. It tells us that everything is evolving. It also tells us that our beliefs and behaviors are evolving many orders of magnitude faster than our internal programming. Therefore, we can safely assume that our internal programming is fixed.

“Although we can safely assume that we have fixed internal programming, we do not know, and may never know completely, what this internal programming is. The best we can hope to know is what it is not. Thus, the process of solving the global economic problem must include the process of eliminating inadequate teleonomic theories from the set of all teleonomic theories.

*“Rather than basing evolutionary explanations on what we currently want, which ignores the possibility of solving problems by learning to live more wisely, we can base them on the set of all teleonomic theories. Over time we can tighten these loose explanations by eliminating members of this set.”*

### Chapter 3, A New Foundation for Explanation, fourth footnote

Added the fourth footnote:

<sup>7</sup> Teleonomic theories are positive in that they describe the world as it is: We are motivated to follow our internal programming. Teleonomic theories are also normative in that they prescribe what we ought to do: We *owe it to ourselves* to live good lives, which is the end we achieve by successfully following our programming. Thus, we *ought* to follow our internal programming. For more on the philosophical argument supporting this apparent contradiction of David Hume, see Mortimer Adler’s book, *Ten Philosophical Mistakes*.”

### Chapter 3, A New Foundation for Explanation, fifth footnote

Added the fifth footnote:

<sup>8</sup> This may not always be the case. The next economic era is most likely to be defined by our ability to change our internal programming. A major challenge of the information age must be to accumulate the wisdom we will need to meet the challenges of the coming era.”

### Chapter 3, A New Foundation for Explanation, seventh endnote

<sup>7</sup> Einstein, Albert, “On the Method of Theoretical Physics”, The Herbert Spencer Lecture delivered at Oxford, June 10, 1933, reprinted in *Ideas and Opinions* (New York: The Modern Library, 1994).”

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was changed to:

“<sup>7</sup> Adler, Mortimer, *Ten Philosophical Mistakes* (New York: Macmillan, 1985), Part 2.”

## Chapter 3, Summary

“This chapter proposed a strategy for progress, which involves **defining and** gradually tightening **a loose theory** of means to our ultimate ends. **This loose theory of means consists of a core theory of means suspended from a set of ultimate ends.** This **loose theory** stands ready to be proved less useful than competing explanations in helping us find better problems to solve.”

was changed to:

“This chapter proposed a strategy for progress, which involves gradually tightening **loose evolutionary explanations** of means to our ultimate ends. **These explanations** stand ready to be proved less useful than competing explanations in helping us find better problems to solve.”

## Chapter 4, title

“Refining Ultimate Ends” was changed to “Eliminating Teleonomic Theories.”

## Chapter 4, Introduction, first paragraph

“The previous chapter proposed a loose theory of means consisting of a core theory of means suspended from a set of ultimate ends. We can tighten this loose theory by eliminating members from the set of ultimate ends. We do so by eliminating members of the set of all *teleonomic theories*, theories that look to an internal program or programs to explain our ultimate ends.”

was changed to:

“This chapter proposes two means of eliminating teleonomic theories from the set of teleonomic theories that we use to help us find what we need. The first uses our highest ideal to eliminate theories that aim too low. The second uses the concept of emergence to eliminate misleadingly simple theories.”

## Chapter 4, Introduction, second and third paragraphs

The second paragraph was moved to the beginning of the next section. The third paragraph was deleted.

## Chapter 4, Reconciling Teleonomic Theories

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The heading was changed to: “Eliminating Unethical Theories.”

### **Chapter 4, Reconciling Teleonomic Theories, first paragraph, first sentence**

“The major difficulty in developing means of eliminating teleonomic theories is agreeing on metaphysical assumptions about our nature.”

was changed to:

“The major difficulty in developing means of eliminating teleonomic theories **that aim too low** is agreeing on metaphysical assumptions about our nature.”

### **Chapter 4, Eliminating Unethical Theories, third paragraph, last sentence**

“The **following two** sections argue that secular and religious humanists can agree on Albert Schweitzer’s ultimate end of reverence for life.”

was changed to:

“The **balance of this** section argues that secular and religious humanists can agree on Albert Schweitzer’s ultimate end of reverence for life. **If we can agree on this, we can develop rules for eliminating theories that aim too low. For example, we can eliminate theories that are based on too narrow a conception of who ‘we’ are.**”

### **Chapter 4, Eliminating Teleonomic Theories**

The heading was changed to: “Eliminating Simplistic Theories.”

### **Chapter 4, Eliminating Simplistic Theories, first paragraph**

“If we can agree on the ultimate normative end of reverence for life, then we can develop rules for eliminating theories that don’t yield the best problems for achieving this end. An obvious rule is to eliminate theories that are based on too narrow a conception of who “we” are. A less obvious rule is to eliminate theories that are based on a single level of abstraction.”

was deleted.

### **Chapter 4, Eliminating Simplistic Theories, new second paragraph, first sentence**

Changed “beware of” to “eliminate.”

### **Chapter 4, Summary**

“This chapter proposed using humanism’s conceptual framework and highest ideal to refine the set of ultimate ends that deserve our tolerance. This process provides us with

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both a moral vision and a conceptual framework for thinking about our ultimate ends and the best means to them.”

was changed to:

“This chapter proposed two means of refining the set of teleonomic theories that we use to help us find what we need. What remains are theories that deserve our tolerance. This tolerance is based on our incomplete knowledge of our ultimate ends and the best means to them rather than on the presumed right to do as we please.”

### Chapter 5, title

Changed “Increasing Excellence” to “Increasing Excellence in Means.”

### Chapter 7, Introduction, fourth sentence

Started a new paragraph.

### Chapter 8, first paragraph, second and third sentences

“To progress readily, we need a loose **theory** of means **suspended from a set of ultimate ends**. Over time, we can tighten **this loose theory** by discovering more about our **ultimate ends** and the best means to them.”

was changed to:

“To progress readily, we need **recursionist explanations, loose evolutionary explanations** of means **founded on teleonomic theories**. Over time, we can tighten **these loose explanations** by discovering more about our **needs** and the best means to **satisfy** them.”

### Chapter 8, first paragraph, second paragraph

“**This loose theory** differs markedly from current economic theories. Where current microeconomic theories help us use scarce resources to achieve our subordinate ends, **this theory** helps us choose these ends. **It does** this by providing us a world-view and related conceptual framework for thinking about our ultimate ends and the best means to them. **It** also helps prevent us from being blinded by the models that we use to get what we want. And where current macroeconomic theories attempt to help government officials achieve their ends, **this theory** helps officials design **a decision strategy** to help all of us achieve our ultimate ends with a minimum amount of wasteful turbulence in the flow of resources. **It** tells us that we should judge the interventions of governments rather than the actions of individuals and that we should err on the side of not intervening justly rather than intervening unjustly. Like physicians, governments should first do no harm. Equally important, **it** reminds us that wise decision-making requires moral vision.”

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was changed to:

“**Recursionist explanations** differ markedly from current economic theories. Where current microeconomic theories help us use scarce resources to achieve our subordinate ends, **recursionist explanations** help us choose these ends. And where current macroeconomic theories attempt to help government officials achieve their ends, **recursionist explanations** help officials design decision strategies to help all of us achieve our ultimate ends with a minimum amount of wasteful turbulence in the flow of resources. **They** tell us that we should judge the interventions of governments rather than the actions of individuals and that we should err on the side of not intervening justly rather than intervening unjustly. Equally important, **they** remind us that wise decision-making requires moral vision.”

### Chapter 8, third paragraph, first sentence

“The moral vision inherent in **this theory** shows us that by becoming a part of something bigger than ourselves, we can become more than we currently are, but if we try to help others foolishly, we can do far more harm than good.”

was changed to:

“The moral vision inherent in **recursionist explanations** shows us that by becoming a part of something bigger than ourselves, we can become more than we currently are, but if we try to help others foolishly, we can do far more harm than good.”

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**Version 2002.08.28**

### Entire book

Changed “modern Austrian” to “Austrian.”

### Preface, new first paragraph

“Modern economic science focuses on the allocation of scarce resources. In doing so, it ignores the process of creating useful knowledge. Equally important, its theory of consumption ignores knowledge of how to live wisely. Arguably, these are the two most important aspects of information age economies.”

was changed to:

“The economics profession is in the midst of a crisis. Its core theory of means focuses on what is of primary importance in industrial age economies, the allocation of scarce resources. In doing so, it ignores what is of primary importance in information age economies, the creation of useful knowledge.”

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## Preface, new second paragraph, first sentence

“Billionaire speculator George Soros believes that the threat posed by **modern economic science** is dire.”

was changed to:

“Billionaire speculator George Soros believes that the threat posed by **this crisis** is dire.”

## Preface, new second paragraph, last sentence

Reinserted the sentence:

“In effect, Soros calls for recognizing the scarcity of knowledge as well as non-knowledge resources.”

## Preface, new third paragraph

“The person most responsible for this “Second Wave” (industrial age) bias is **Adam Smith, the grandfather of modern economic science. Smith was faced with the problem of modeling two sorts of complex adaptive systems, human beings and the system of relationships that join them. He naturally chose a simpler model of human nature for his “political economy,” which focuses on human relationships, than the one he chose for his moral philosophy, which focuses on human nature. In making this simplification, Smith separated political economy from moral philosophy.**”

was changed to:

“The person most responsible for this “Second Wave” (industrial age) bias is **the Scottish Enlightenment moral philosopher, Adam Smith. Smith wrote two great works of moral philosophy. In his first, *The Theory of Moral Sentiments* (1759), Smith focused on the nature of altruism. In his second, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776), he focused on the complex adaptive system of human relationships. Given the overwhelming complexity of simultaneously modeling two complex adaptive systems, human organisms and human organizations, Smith chose a much simpler model of human nature for *Wealth* than he did for *Moral Sentiments*. In making this simplification, Smith created a new branch of moral philosophy, *political economy*.**”

## Preface, new seventh paragraph

“An immediate benefit of this strategy is that it provides us with a strategic world-view and related conceptual framework that can help us find the better tactical problems to solve. Providing such a framework is the first step in any plan for working and living together.”

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was deleted.

### **Chapter 2, *Knowledge Induction*, fifth paragraph, fourth sentence**

Started a new paragraph and changed:

“Which of these solutions the team chooses is often a matter of how it defines the problem.”

to:

“Stressing the production system produces small manufacturing problems. The nature of these problems is not always obvious.”

### **Chapter 2, *Visibility*, last paragraph, last sentence**

“Increasing visibility by these and other means makes it easier to find problems, **which is the first step toward improving the process.**”

was changed to:

“Increasing visibility by these and other means makes it easier to find problems.”

### **Chapter 3, *Theories produce predictions and explanations of causation.*, second paragraph, second sentence**

“It is possible to explain causation without being able to predict in the traditional (Newtonian) sense, as is the case in what physicists call *deterministic chaotic systems*.”

was changed to:

“In *deterministic chaotic systems*, physicists can explain causation without being able to predict in the traditional (Newtonian) sense.”

### **Chapter 3, *A New Foundation for Explanation*, second paragraph, first two sentences**

“Why has the economics profession failed to provide decision-makers with theories that explain causation based on what the wise would do? The major reason is that most schools of economics believe that the primary purpose of economic theories is to predict, not explain, the world.”

was changed to:



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“The major reason the economics profession has failed to provide such theories is that most schools of economics believe that the primary purpose of economic theories is to claim, not explain, the world.”

### **Chapter 3, A New Foundation for Explanation, fourth paragraph, third sentence**

“The founder of **modern** Austrian economics, **Ludwig von Mises**, chose to avoid this and other metaphysical problems in the traditional manner, which is to define ‘wealth’ as consumer goods and the resources to produce consumer goods.”

was changed to:

“The founder of Austrian economics, **Carl Menger**, chose to avoid this and other metaphysical problems in **what was to become** the traditional **marginalist** manner, which is to define ‘wealth’ as consumer goods and the resources to produce consumer goods.”

### **Chapter 3, A New Foundation for Explanation, fourth paragraph, last sentence**

Moved Ludwig von Mises endnote to first sentence of the third paragraph. Dropped the Chapter 1 reference.

### **Chapter 3, A New Foundation for Explanation, fifth paragraph, last sentence, footnote**

Added the following paragraph at the beginning of the footnote:

“C. S. Pittendrigh coined ‘teleonomic’ to differentiate end directed biological theories from Aristotle’s end directed (teleological) theories. The use of ‘teleonomic’ here does not imply that all biological programming is molecular level programming. It allows the emergence of higher level programming, e.g., the emergence of mental and spiritual needs.”

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**Version 2002.08.31**

### **Preface, first paragraph**

“Economists once aspired to be worldly philosophers, literally lovers of useful knowledge. Had the economics profession remained faithful to this calling, modern economics would be the science of useful knowledge. The phrase ‘economics of knowledge’ would be redundant, not radical. Unhappily, it is not.”

was deleted.

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### **Preface, new second first paragraph, second and third sentences**

“In an article published in the February 1997 issue of *The Atlantic Monthly* titled *The Capitalist Threat*, Soros wrote that **the main threat to an open society no longer comes from communism but from capitalism. He fears that** we place too much faith in laissez-faire economic theories.”

was changed to:

“In an article published in the February 1997 issue of *The Atlantic Monthly* titled *The Capitalist Threat*, Soros wrote that we place too much faith in laissez-faire economic theories.”

### **Preface, new eleventh paragraph, end**

Added the following sentences:

“It asks them to be worldly philosophers, literally lovers of useful knowledge. (Had the economics profession remained faithful to this calling, modern economics would be the science of useful knowledge. The phrase ‘economics of knowledge’ would be redundant, not radical. Unhappily, it is not.)”

### **Chapter 3, A New Foundation for Explanation, third paragraph, sixth sentence**

“To obtain a more useful truth, we need an explicitly moral theory of economics —”

was changed to:

“To obtain a more useful truth, we need an explicitly moral theory of **evolutionary** economics —”

### **Chapter 3, Summary, second sentence**

“These explanations stand ready to be proved less useful than competing explanations in helping us find better problems to solve.”

was changed to:

“These explanations **should** stand ready to be proved less useful than competing explanations in helping us find better problems to solve.”

### **Chapter 4, *Religious Humanist Worldly Ends*, first paragraph, third sentence**

“For the statement “the ultimate end of life is a good life” to be self-evident, we cannot imagine a situation where the statement “the ultimate end of life is not to live a good life” is true.”

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was changed to:

“ For the statement “the ultimate end of life is a good life” to be self-evident, we cannot imagine a situation where the **contrary** statement “the ultimate end of life is not to live a good life” is true.”

### **Chapter 4, *Religious Humanist Worldly Ends*, second paragraph, second and third sentences**

“ To begin to answer this question we must recognize that ends can concern either **states** or processes. Because ends that concern **states** are bounded in time, they are known as *temporal* ends.”

was changed to:

“To begin to answer this question we must recognize that ends can concern either **specific events** or processes. Because ends that concern **specific events** are bounded in time, they are known as *temporal* ends.”

### **Chapter 4, *Religious Humanist Worldly Ends*, third paragraph**

“Happiness, which is a whole life spent living well, is the ultimate normative end of life. We cannot imagine a higher normative end of life than happiness. All other worthy normative ends of life, such as serving others, perfecting our spirit, or obeying the teachings of God’s prophets are means to happiness.”

was deleted.

### **Chapter 4, *Religious Humanist Worldly Ends*, fifth paragraph**

Inserted the paragraph:

“For the religious humanist the highest normative end is living the saintly life. This life includes attaining the temporal end of experiencing mystical union with the infinite Being. As a result of this union/reunion, the person assumes a divine subordinate end consistent with Schweitzer’s reverence for life. This universal normative end serves as the basis for reconciling disparate religions.”<sup>+</sup>”

The second footnote (fifth paragraph, second sentence, +):

“+ A common belief in many religions is that an awakening to one’s divine self is necessary to achieve the ultimate end of existence. Because a spiritual awakening yields a clearer understanding of ones needs and how best to satisfy them, it is potentially an aid to happiness. The process leading up to the awakening, which may keep us from satisfying our needs, can be seen as an investment in happiness as well as the achievement of the ultimate temporal end of life.”

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was replaced by the a footnote created from the seventh through ninth paragraphs.

### **Chapter 4, *Religious Humanist Worldly Ends*, sixth and seventh paragraphs**

“The most extreme conflicts between these two competing ends involve ritual death. Examples include Mayan ball games that culminated in the ritual beheading of the captain of the losing team, Jainist suicide by starvation, and Japanese kamikaze. At the heart of ritual death lies the belief that sacrificing one’s life for the sake of others or dying in a state of ecstasy leads to the ultimate end of existence. This mixture of altruism and mystical oneness suggests a Trinitarian argument against ritual death: We have an internal program that motivates us toward bliss, which is either mystical union with the Absolute (magical mysticism) or mystical union with His creative spirit, which manifests Herself as the Universe (complete ethical mysticism). Achieving mystical union with either is union with both and with the divine element in us. Once we have completed this union, we assume the three-element Godhead’s purpose, which includes bringing ever more divine consciousness into the world. We achieve this divine subordinate end by pursuing happiness.”

“In summary, religious humanist ultimate normative end of life is living a good life, which we achieve by living as high in our hierarchy of needs as possible. At the top of this hierarchy is Schweitzer’s need for mystical oneness, which we can satisfy best with a practical combination of magical and complete ethical mysticism. Achieving mystical oneness by relinking with the divine element within ourselves may cause us to assume the subordinate normative end of the divine, which is to bring ever more divine consciousness into the world.”

were replaced by:

“The most extreme conflicts between these two competing ends involve ritual death. At the heart of ritual death lies the belief that sacrificing one’s life for the sake of others or dying in a state of ecstasy leads to the ultimate end of existence.

“Examples of ritual death include Mayan human sacrifice, Jainist suicide by starvation, and Japanese kamikaze attacks. All of these arise from false beliefs. Mayan human sacrifices were based on the belief that such sacrifices insured good crops. Jainist suicide by starvation was based on the belief that the death of the saint would benefit the rest of life more than helpful devotion to it. Kamikaze attacks were based on the belief that such sacrifice was the best means of insuring the future of the Japanese people. These religious practices fell into disrepute when the beliefs supporting them were proved to be false.”

### **Chapter 4, *Eliminating Simplistic Theories*, ninth paragraph, first sentence**

Inserted the former third footnote on Trinitarianism. Moved the endnote into a reference.

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## Chapter 4, Eliminating Simplistic Theories, ninth paragraph, third sentence

“From this perspective, all other living things are extensions of our true selves.”

was deleted.

## Chapter 5, Introduction, first paragraph

“Increasing excellence in **means** is a matter of substituting knowledge for non-knowledge resources **in progressing toward our ultimate ends. This can be a matter of choosing better means to a given subordinate end. It can also be a matter of choosing better subordinate ends.**”

was changed to:

“**The recursionist core theory of means is both simple and straightforward: We are motivated to satisfy our needs.** Increasing excellence in **satisfying our needs** is a matter of substituting knowledge for non-knowledge resources. **We do this by choosing either better subordinate ends or better means to a given subordinate end.**”

## Chapter 5, Introduction, second paragraph, third sentence

“To paraphrase Mark Twain, ‘It ain’t what you don’t know that gets you into trouble. It’s what you know for sure that just ain’t *useful*.’”

was deleted.

## Chapter 7, Just Taxation, last paragraph, last sentence

“High on this list are **income** taxes, which discourage acquiring knowledge and taking risks.”

was changed to:

“High on this list are taxes **on profits**, which discourage acquiring knowledge and taking risks.”

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**Version 2002.09.05**

## Preface, eighth paragraph, third and fourth sentences

“To make it easier for readers to understand my meaning, I’ve used the following conventions. When I use a term as a term, I enclose it in single quotation marks (‘’),

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and when I use a term to denote one of several meanings, I enclose it in double quotation marks (“”).”

was changed to:

“To make it easier for readers to understand my meaning, I have used single quotation marks (‘’) to denote terms and double quotation marks (“”) to denote one of several meanings of of terms.”

### **Preface, ninth paragraph**

The second sentence:

“It potentially puts them in a different role, solving a different sort of problem, using a different concept of science, in order to meet better the needs of their information age customers.”

was deleted. The parenthesis around the last three sentences in the paragraph were removed.

### **Acknowledgments, fourth paragraph, eighth sentence**

Changed “ my studies at the Stanford Graduate School of Business” to “business school.”

### **Acknowledgments, fifth paragraph**

Inserted the paragraph:

“The fifth is the speaker at the Stanford Graduate School of Business orientation meeting who told our incoming class (1979) that if we learned nothing else in the next two years, we should learn the difference between efficiency and effectiveness. I may not have remembered his name, but I remembered his advice.”

### **Chapter 3, title**

Changed “The Strategy for Progress” to “A New Foundation.”

### **Chapter 3, second footnote**

Changed “common sense” to “practical” in the second sentence.

Added the following sentences to the end of the footnote:

“The inspiration for this practical approach is the discrete decision tree analysis technique that parses complex decisions into decision objects and uncertain event

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objects. Explanations help us formulate decision objects and predictions help us formulate uncertain event objects.”

### **Chapter 3, *Theories as Refinements of Everyday Thinking*, fourth paragraph**

Changed “pragmatic” to “practical” throughout.

### **Chapter 4, *Eliminating Unethical Theories*, third paragraph, last sentence**

“For example, we can eliminate teleonomic theories based on too narrow a conception of who ‘we’ are.”

### **Chapter 4, *Religious Humanist Worldly Ends***

This subsection was rewritten. The structure returned to what it was before the most recent rewrite.

### **Chapter 5, *Introduction*, first paragraph, last sentence**

“We do this by choosing **either** better subordinate ends **or** better means to **a** given subordinate end.”

was changed to:

“We do **so** by choosing better subordinate ends **and** better means to given subordinate ends.”

### **Chapter 5, *Introduction*, first paragraph, last sentence**

“Some concepts derived from marginalist economics tend to blind us to better ends **and means**.”

was changed to:

“Some concepts derived from marginalist economics tend to blind us to better **subordinate** ends.”

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**Version 2002.09.12**

### **Preface, title**

“Again, I was inspired by Ohno’s **work**.”

was changed to:

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“Again, I was inspired by Ohno’s **strategy**.”

## Chapter 1, title

Changed “Strategic Assets” to “A Strategy for Progress.”

## Chapter 1, Conceptual Framework, second paragraph, last sentence

“**As philosopher of science Thomas Kuhn observed**, once we have learned to conceptualize the world in one way, it is difficult for us to do so in another.”

was changed to:

“**Once** we have learned to conceptualize the world in one way, it is difficult for us to do so in another.”

## Chapter 1, Modern Economics' Blind Spot, third paragraph, third sentence

“The EOQ model yields the quantity at which the marginal cost and benefit of **setting up more often** just equal one another.”

was changed to:

“The EOQ model yields the quantity at which the marginal cost and benefit of **holding inventory with respect to setting up** just equal one another.”

## Chapter 1, The Recursionist Strategy, fourth paragraph, fourth sentence

Changed “sumo wrestling” to “dog fighting.”

## Chapter 1, Overview, third sentence

“Chapters three, four, and five present the strategy.”

was changed to:

“Chapters three, four, and five expand on the recursionist strategy. The third discusses the philosophical foundation. The fourth provides means for tightening the loose theory on which the foundation is based. The fifth offers recursionist alternatives for several marginalist concepts.”

## Chapter 3, title

Changed “The Strategy for Progress” to “A New Foundation.”



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## Chapter 3, *Theories are refinements of everyday thinking*, last paragraph, second sentence

Changed “measure” to “test.”

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## Chapter 1, *Managerial Excellence in Means*, last paragraph

Changed “wants and desires” to “wants” throughout.

## Chapter 3, first footnote:

“A corollary of the proposition that all theories are subjective is that the tenability of theories depends on our belief in the meanings of their concepts. Consider the argument ‘because the ground is wet, it must have rained.’ If we define ‘rain’ as anything that makes the ground wet, the argument is not only tenable but also tautological, true by definition. However, if we use the common definition of ‘rain,’ which excludes such causes of wet ground as morning dew, melted snow, and lawn sprinklers, the argument is untenable. Whether this argument is tenable depends on what we believe ‘rain’ means.

“The EOQ model illustrates this corollary. If we believe that what is best is what is ‘efficient,’ then the EOQ model is tenable. On the other hand, if we believe that what is best is what is ‘efficient and effective,’ then the EOQ model is tenable only if there is no possibility of learning. Whether the EOQ model is tenable depends on what we believe ‘best’ means.

“Similarly, marginalist economics as a whole depends on the marginalist definition of excellence in means. For marginalist models to yield their conclusions, economic agents must not learn through experience. From a common sense perspective, this requirement makes marginalist models untenable. Failing to learn through experience when it is possible to do so at negligible cost is foolish. In the language of marginalist economics, assuming that consumers and producers do not learn from experience means assuming that consumers do not try to maximize utility and producers do not try to maximize profits. This conflicts with the textbook assumptions that they do.”

was deleted.

## Chapter 3, *Theories produce predictions and explanations of causation.*, first paragraph, second sentence

“Predictions tell us what is likely to happen given a particular set of circumstances: explanations tell us what causes a particular phenomenon.”

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was changed to:

“A prediction is knowledge of what is likely to happen under a particular set of conditions. An explanation of causation is knowledge that helps us predict what is likely to happen under a variety of conditions.”

### Chapter 3, *Theories produce predictions and explanations of causation.*, second and third paragraphs

“Some theories explain relatively better than they predict. In *deterministic chaotic systems*, physicists can explain causation without being able to predict **in the traditional (Newtonian) sense**. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate.”

“Other theories predict relatively better than they explain. For example, quantum mechanics provides very accurate statistical predictions of subatomic events without explaining **fully the causes of these events**. Physicists currently seek better means of explaining, theories of what lies “beneath” or “behind” quantum mechanics, e.g., superstring theory, rather than better means of predicting what quantum mechanics predicts.”

were changed to:

“**Explanations of causation are more than simply predictions ‘written backwards.’** In *deterministic chaotic systems*, physicists can explain causation without being able to predict **equally well**. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the ‘weather.’ In the long term, the best we can hope to do is to predict the bounds of the trajectory, the ‘climate.’ **Further**, quantum mechanics provides very accurate statistical predictions of subatomic events without explaining **their causes equally well**. Physicists currently seek better means of explaining, theories of what lies ‘beneath’ or ‘behind’ quantum mechanics, e.g., superstring theory, rather than better means of predicting what quantum mechanics predicts.”

and placed in a footnote at the end of the first paragraph.

### Chapter 3, second footnote

“The meaning of ‘explanation of causation’ is problematic. The practical approach taken here is to define it functionally. An explanation of causation is knowledge that

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helps us find problems to solve. Thus, the statement “Theories that explain causation help us find problems to solve.” is true by definition. The inspiration for this practical approach is the discrete decision tree analysis technique that parses complex decisions into decision objects and uncertain event objects. Explanations help us formulate decision objects and predictions help us formulate uncertain event objects.”

was replaced by:

“Decision analysis consists of three basic steps: (1) defining alternatives, (2) defining the details necessary to evaluate alternatives, and (3) evaluating alternatives. Theories that explain causation help us define alternatives. Theories that predict help us define the details necessary to evaluate alternatives. Specifically, they help us define the probabilities of uncertain events.”

### **Chapter 5, Introduction, first paragraph, last sentences**

“We are motivated to satisfy our needs. Increasing excellence in satisfying our needs is a matter of substituting knowledge for non-knowledge resources. We do so by choosing better subordinate ends and better means to given subordinate ends.”

was replaced by:

“Excellence is the wise use of resources in satisfying our needs. We increase excellence by choosing better subordinate ends and better means to given subordinate ends.”

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## **Version 2002.10.02**

### **Preface, second paragraph, last sentence**

“In **effect**, Soros calls for recognizing the scarcity of knowledge as well as non-knowledge resources.”

was changed to:

“In **economic terms**, **he** calls for recognizing the scarcity of knowledge as well as non-knowledge resources.”

### **Preface, third paragraph, quote**

Removed added emphasis.

### **Preface, fourth paragraph, first sentence**

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Reversed positions of “Second Wave” and “industrial age.”

### Preface, fourth paragraph

“The **person most responsible** for this industrial age (“Second Wave”) bias **is** the Scottish Enlightenment moral philosopher, Adam Smith. Smith wrote two great works of moral philosophy. In the first, *The Theory of Moral Sentiments* (1759), Smith focused on **the nature of** altruism. In the second, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776), he focused on **the complex adaptive system of** human relationships. Given the overwhelming complexity of simultaneously modeling **two complex adaptive systems**, human organisms and human organizations, Smith chose a **much** simpler model of human nature for *Wealth* than he did for *Moral Sentiments*. In making this simplification, Smith created a new branch of moral philosophy, *political economy*.”

was changed to:

“The **source of** this industrial age (“Second Wave”) bias is the Scottish Enlightenment moral philosopher, Adam Smith. Smith wrote two great works of moral philosophy. In the first, *The Theory of Moral Sentiments* (1759), Smith focused on altruism. In the second, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776), he focused on human relationships. Given the overwhelming complexity of simultaneously modeling human organisms and organizations, Smith chose a simpler model of human nature for *Wealth* than he did for *Moral Sentiments*. In making this simplification, Smith created a new branch of moral philosophy, *political economy*.”

### Preface, fifth paragraph, last sentence

“Regrettably, economists are right when they say that a rigorous theory that **reconciles ethics and modern economics, a precise theory that** aims at progress rather than growth, is beyond our grasp”

was deleted.

“Regrettably, economists are right when they say that a rigorous theory that aims at progress rather than growth is beyond our grasp.”

### Chapter 1, Conceptual Resources, third paragraph, third through last sentences

“This advantage is equal to the cost of placing into service the pattern not yet in service. Consider the advantage that existing railroad track has over the same rails set on the same track bed at a slightly different distance between rails. This advantage is equal to the cost of resetting the pattern, in this case, the cost of resetting the rails. This *lock-in effect*<sup>1</sup> applies to all forms of useful knowledge, including concepts. Once we have learned to conceptualize the world in one way, it is difficult for us to do so in another.”

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was changed to

“When combined with economies of scale, this localized “lock-in” effect can become significant.<sup>1</sup> This is as true of conceptual frameworks as it is for railroad networks. Once we have learned to conceptualize the world in one way, it is difficult for us to do so in another.<sup>2</sup> Yet this is what we must do if we are to overcome our industrial age bias.”

### **Chapter 1, Conceptual Resources, third paragraph, footnote**

“Economists associate lock-in with increasing returns. This large scale phenomenon emerges from the fundamental advantage knowledge in use has over knowledge not yet in use.”

was deleted.

### **Chapter 1, Managerial Excellence in Means, first paragraph, last sentence**

“Efficiency concerns choosing solutions to given problems and effectiveness concerns choosing problems to solve.”

was deleted.

### **Chapter 1, Managerial Excellence in Means, last paragraph**

“The distinction between ...” was inserted in front of the second paragraph.

### **Chapter 1, Managerial Excellence in Means, new third paragraph, second sentence**

“It also permits finding better problems to solve.”

was deleted.

### **Chapter 1, Managerial Excellence in Means, new third paragraph, last sentence**

“Choosing the right problem to solve is as important as choosing the right solution to a given problem.”

was moved to the end of the second paragraph.

### **Chapter 1, Managerial Excellence in Means, third through fifth paragraphs**

Converted the three points made in these three paragraphs to bullet paragraphs. The new paragraph and three bullet paragraphs were moved to the beginning of the next section.

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## Chapter 1, Strategic Assets, new second paragraph, first sentence

“Changing our concept of excellence in means to **the managerial concept of efficiency** and effectiveness changes the global (universal) economic problem into one of how we, members of the community of beings capable of using the knowledge that we create, choose to progress toward our ultimate ends.”

was changed to:

“**In short, changing our concept of excellence in means to ‘efficiency and effectiveness’** changes the global (universal) economic problem into one of how we, members of the community of beings capable of using the knowledge that we create, choose to progress toward our ultimate ends.”

Inserted a paragraph break at the end of the sentence.

## Chapter 3, first two sections

The sections titled “Introduction” and “The Nature of Theories” were combined under the latter's title.

## Chapter 3, *Theories are subjective.*, first paragraph, last sentence

“We would be foolish to discard theories based on how subjective they seem to us.”

was deleted.

## Chapter 3, *Theories produce predictions and explanations of causation.*, second sentence

“An explanation of causation is **knowledge** that helps us predict what is likely to happen under a variety of conditions.”

was changed to:

“An explanation of causation is a **deeper understanding** that helps us predict what is likely to happen under a variety of conditions.”

## Chapter 3, Summary, first sentence

“This chapter proposed a strategy for progress, which involves gradually tightening loose evolutionary explanations of means to our ultimate ends.”

was changed to:

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“This chapter proposed a decision-oriented, evolutionary foundation for decision-oriented, evolutionary economic explanations of causation.”

Inserted a paragraph break at the end of the sentence.

### Chapter 5, Production Technology

Changed title from “Production Technology” back to “Production.”

Changed:

“**Production technology is not simply something that comes out of a research and development lab or manufacturing engineering department.** As the rapid tool-setting example showed, a well designed and implemented production process can produce both product and the knowledge of how to improve the production process. Such joint production requires people that have the practical wisdom to think of better ways to produce. It also requires trading relationships that support the exchange of **sensitive information. Managers must trust their employees with valuable information about products, processes, customers, and suppliers, and employees must trust managers with information that potentially replaces their current services.**”

“**The relationships between** excellence in consumption, trade, and production potentially create a complex virtuous cycle. **Efficient production potentially leads to more of the things that satisfy our needs, which potentially leads to better lives and greater practical wisdom. Greater practical wisdom potentially leads to more efficient production and trade, which potentially leads to greater practical wisdom and better lives.** Only by pursuing this complex cycle can we realize the full potential of the information age.”

to:

“As the rapid tool-setting example showed, a well designed and implemented production process can produce both product and production technology. Such joint production requires people that have the practical wisdom to think of better ways to produce. It also requires trading relationships that support the exchange of **dangerous information. Excellence in consumption, trade, and production potentially create a complex virtuous cycle. Only by pursuing this complex cycle can we realize the full potential of the information age.**”

### Chapter 7, Just Taxation, first paragraph, first sentence

“All forms of taxation disrupt the **coordination** of decision-making.”

was changed to:

“All forms of taxation disrupt the **process** of decision-making.”

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## Chapter 7, third footnote, third sentence

Changed “conservative actions” to “conservative behaviors.”

## Chapter 7, third footnote, last two sentences

“Both were blind to the possibility of discovering **values and** behaviors that help us satisfy our needs better than existing ones do. In information age economies, what matters most is not values and behaviors, but vision and concepts.”

was changed to:

“Both were blind to the possibility of discovering behaviors that help us satisfy our needs better than existing ones do. In information age economies, what matters most is not values (**and related** behaviors), but vision (**and related** concepts).”

## Chapter 7, Conclusion, last paragraph, last sentence

“The strategy put forth in this work **increases** this propensity.”

was changed to:

“The strategy put forth in this work **aims to increase** this propensity.”

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## Version 2002.10.14

### Entire work

Endnotes were converted to footnotes. All footnotes were renumbered by chapter.

### Chapter 1, Conceptual Resources

Renamed this first section, “Introduction.” Moved existing paragraphs down the the beginning of the next section, “Modern Economics’ Blind Spot.”

### Chapter 1, first footnote

“This work classifies resources into three categories: (1) scarce resources, (2) free resources, and (3) knowledge resources. Scarce resources are those that are costly to use. Free resources are those that are costless to use and costless to put into production. Knowledge resources are those that are costless to use but costly to put into production.”

was deleted.



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## Chapter 1, Modern Economics' Blind Spot, last paragraph, last sentence

Added the sentence:

“(Readers who are unfamiliar with the Toyota manufacturing system as a tool for inducing production technology ought to read the Appendix before proceeding.)”

## Chapter 1, Overview, first three sentences

“The remainder of this work presents a strategy for creating knowledge that is useful in progressing toward our ultimate ends. The second chapter prepares the reader to view the world from the new perspective. Chapters three, four, and five expand on the recursionist strategy. The third discusses the philosophical foundation. The fourth provides means for tightening the loose theory on which the foundation is based. The fifth offers recursionist alternatives for several marginalist concepts. The final two chapters discuss what modern economists call macroeconomic issues. The sixth argues that the fundamental such issue ought to be how we can progress toward our ultimate ends with the least amount of economic turbulence and the seventh discusses how government policy makers can address this problem.”

was changed to:

“This chapter introduced a strategy that provides all of us with a conceptual framework for thinking about how best to progress toward our ultimate ends. The next three chapters expand on this strategy. *A New Foundation* discusses the philosophical foundation. *Eliminating Teleonomic Theories* provides means for tightening the loose theory on which the foundation is based. *Increasing Excellence in Means* offers recursionist alternatives for several potentially misleading marginalist concepts. The final two chapters discuss what modern economists call macroeconomic issues. *Progress and Turbulence* argues that the fundamental such issue ought to be how we can progress toward our ultimate ends with the least amount of economic turbulence and *Government Policy* discusses how government policy makers can address this problem.”

## Chapter 2

Chapter 2 was put into an appendix.

## Chapter 2, *Theories are refinements of everyday thinking.*, fourth paragraph, last sentence

“Classic examples are Darwin’s theory of evolution, which provides the foundation for the life sciences, and plate tectonics, which does the same for the earth sciences.”

was changed to:

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“Classic examples are Darwin’s theory of evolution, which provides the foundation for **biology**, and plate tectonics, which does the same for **geology**.”

### **Chapter 2, A New Foundation for Explanation, fourth paragraph, fourth sentence**

“Supporters of this concept of wealth believe it to be value-neutral.”

was changed to:

“Supporters of this **subjectivist** concept of wealth believe it to be value-neutral.”

### **Chapter 2, A New Foundation for Explanation, fifth paragraph, first sentence**

“We can correct this deficiency by replacing Austrian economics’ **marginalist** foundation with an evolutionary one.”

was changed to:

“We can correct this deficiency by replacing Austrian economics’ **subjectivist** foundation with an evolutionary one.”

### **Chapter 4, Profit, second through fourth sentences**

“**From the marginalist perspective, entrepreneurs profit by managing their businesses efficiently. From the recursionist, all of us profit by deciding wisely. Because the money we save from not buying what we don’t need is just as useful to us as the money we receive from trading and producing wisely,** the profits that we create by consuming wisely are just as real as those that we create by trading or producing wisely.”

was changed to:

“**We** profit by deciding wisely. **The** profits that we create by consuming wisely are just as real as those that we create by trading or producing wisely.”

### **Afterword, first paragraph, second sentence**

Changed “nearly three years” to “nearly four years.”

### **Afterword, last paragraph and closing**

“In the months since the presidential election, I’ve speculated whether a revolution in the way thoughtful Americans view ethics, economics, and politics would be sufficient to cause the rise of a “progress and freedom” party at the center of American politics. The terrorist attack on September 11 made such speculation less theoretical. The terrorists claim to attack the Great Satan, the hedonistic destroyer of Islamic traditions.

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Americans must reveal the terrorists to be a hindrance to progress toward a good life for all. The surest way to do so is for Americans to rededicate themselves to progress and freedom, the intertwined ideals that made the United States of America great.”

was changed to:

“Implicit in this call for progress and freedom, the intertwined ideals that made the United States of America great, is a warning not to confuse modernism with lucidity. The cultural journey from dark inertia to lucidity need not pass through hedonism.”

Changed date from September 26, 2001 to October 15, 2002.

### Appendix, Introduction, first paragraph, second sentence

“Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to **illustrate** the **potential** virtuous **circle involving** the division of labor **and the expansion of market size.**”

was changed to:

“Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to **introduce** the virtuous **dynamic that drove early industrial age economies: the self-reinforcing combination of** the division of labor and the expansion of market size.”

### Appendix, Introduction, second paragraph

“What makes JIT manufacturing exemplary is its information age organization and management, which are based on the self-fulfilling belief that manufacturing processes produce **not only saleable products but also knowledge of how to produce more efficiently. As shown in the rapid tool-setting example, when the potential for learning is great, manufacturing excellence requires creating knowledge at the cost of lowering current ‘production.’ Under these circumstances, less ‘production’ is more productive.**”

was changed to:

“What makes JIT manufacturing exemplary is its information age organization and management, which are based on the self-fulfilling belief that manufacturing processes produce **production technology as well as saleable product. From this perspective, more “production” (of saleable product) is not necessarily more productive.**”

### Appendix, Introduction, fourth paragraph, last sentence

“Instead, they developed a means of inventing **manufacturing** technology, which proved more useful in the long run.”

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was changed to:

“Instead, they developed a means of inventing **production** technology, which proved more useful in the long run.”

### Appendix, Introduction, fifth paragraph, last sentence

“Line workers, supervisors, and production staff, working as a team, solve these problems, thereby **completing the solution to** the complex problem.”

was changed to:

“Line workers, supervisors, and production staff, working as a team, solve these problems, thereby **solving** the complex problem.”

### Appendix, The Efficiency Frontier, title

The title was change to “Shaping Constraints.”

### Appendix, Shaping Constraints, first paragraph

“Like other forms of economic activity, manufacturing involves economic constraints, **which, collectively, form what economists refer to as a *production possibility frontier***. JIT manufacturing offers a new mix of constraints, **hence a new frontier**. **The Toyota version of JIT manufacturing** also provides a method for pushing back its frontier. Understanding two of the factors that determine these constraints—the complexity of the process and the size of the production batch—makes understanding **Toyota’s version of JIT manufacturing easier**. (Unless otherwise noted, all **future** references to JIT manufacturing will refer to the Toyota version.)”

was changed to:

“Like other forms of economic activity, manufacturing involves economic constraints. JIT manufacturing offers a new mix of constraints. **It** also provides a method for pushing back constraints **by creating production technology**. Understanding two of the factors that determine these constraints—the complexity of the process and the size of the production batch—makes understanding **this knowledge creation process easier**.”

### Appendix, *Batch Size*, third paragraph, sixth sentence

“Compared to traditional job shops, they sacrifice flexibility and capital to lower **direct labor, waste, inventory, and indirect unit** costs.”

was changed to:

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“Compared to traditional job shops, they sacrifice flexibility and capital to lower **other** costs.”

### **Appendix, Organization, Procedures, and Tools, third paragraph, last sentence**

“The solution is assigning **people** to more than one machine.”

was changed to:

“The solution is assigning **individual workers** to more than one machine.”

### **Appendix, Organization, Procedures, and Tools, fourth paragraph, last sentence**

“**Here, multimachine manning** saves four full day’s work each shift.”

was changed to:

“**This** saves four full day’s work each shift.”

### **Appendix, Organization, Procedures, and Tools, fifth paragraph, first sentence**

“Multimachine manning makes it possible to accumulate fractions of a full day’s work, **which** makes it possible to automate efficiently in small increments without **creating uneven flows or wasting labor**.”

was changed to:

“Multimachine manning makes it possible to accumulate fractions of a full day’s work. **This** makes it possible to automate efficiently in small increments without **wasting labor or creating uneven flows**.”

### **Appendix, Organization, Procedures, and Tools, last paragraph**

“JIT manufacturing’s organization, procedures, and machine tools lend themselves to incremental improvements by production line workers. The Japanese refer to the process of continuous improvement as ‘kaizen.’”

was deleted.

### **Appendix, Requirements for Kaizen, first paragraph, last sentence**

Changed “a dynamic world-view” to “a learning attitude.”

### **Appendix, A Dynamic Perspective, title**

Changed “A *Dynamic Perspective*” to “A *Learning Attitude*.”

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### Appendix, A Learning Attitude, first paragraph

“A dynamic world-view is one that allows people to think clearly about changing phenomena. Those with a static world-view often find such phenomena paradoxical. Edwin Abbott’s Victorian novel, *Flatland*, provides insight into this problem. Abbott tells the story of the life and travels of A. Square, a resident of the two-dimensional world of Flatland. Residents of Flatland have no concept of height, and so believe that ‘up’ means the same as ‘north.’ Like Swift’s Gulliver, A. Square encounters many strange phenomena, characters, and cultures in his travels. In one adventure, a sphere from the three dimensional world of Spaceland whisks A. Square off the surface of Flatland. This gives him the opportunity to look down onto the plane that forms his world. Later, when attempting to communicate his insights to his fellow Flatlanders, he is at a loss for words to explain the concept of height. The best the he can manage is “up, but not north.” People trying to communicate a dynamic perspective to those with a static view face a similar problem in that those with a static perspective unconsciously think in terms of moving along an efficiency frontier rather than of pushing it back. The following kaizen adages illustrate this. Each is obvious from a dynamic perspective, yet paradoxical from a static one:”

was changed to:

“A learning attitude is the propensity to solve problems by creating knowledge. To people with a learning attitude, excellence in means is a matter of progressing toward their ultimate ends well, rather than simply allocating scarce resources well.”

“Those with a learning attitude have difficulty communicating with those without one. The following kaizen adages illustrate this problem. Each is obvious from a learning perspective, yet paradoxical from a non-learning one:”

### Appendix, A Learning Attitude, last paragraph

“In *Flatland*, the sphere performed apparent miracles by traveling in three dimensions. Similarly, Japanese manufacturers practicing kaizen adapted to the oil shocks of the seventies and the yen shock of the eighties by rapidly pushing back their efficiency frontiers. They thrived by learning wisely.”

was changed to:

“In Edwin Abbott’s Victorian novel, *Flatland*, characters performed apparent miracles by breaking through apparent dimensional boundaries. Similarly, Japanese manufacturers practicing kaizen performed apparent miracles by rapidly pushing back their production possibility frontiers<sup>6</sup>. In lay terms, they thrived by learning wisely.”

plus the footnote:

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“A production possibility frontier is an output hyperspace map of the most efficient use of a given set of production inputs. This conceptual model is founded on the assumption that people do not learn through experience.”

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### Chapter 1, Managerial Excellence in Means, second paragraph, fourth sentence

Changed “wisdom” to “wise”.

### Chapter 2, A New Foundation for Explanation, first sentence

“The major reason the economics profession has failed to provide such theories is that most schools of economics claim that the primary purpose of economic theories is to predict, not explain, **the world**.”

was changed to:

“The major reason the economics profession has failed to provide such theories is that most schools of economics claim that the primary purpose of economic theories is to predict, not explain **causation**.”

### Chapter 2, A New Foundation for Explanation, seventh paragraph, second sentence

Changed “best we can hope to know” to “most we can know.”

### Chapter 2, six footnote, first paragraph, last sentence

“The use of ‘teleonomic’ here does not imply that all biological programming is molecular level programming. It allows the emergence of higher level programming, e.g., the emergence of mental and spiritual needs.”

was deleted. The second paragraph was merged with the first.

### Chapter 2, A New Foundation for Explanation, end

Added the paragraph:

“The problem, once found, is obvious.”

### Chapter 2, Summary, first sentence

“This chapter proposed **a decision-oriented**, evolutionary foundation for **decision-oriented**, evolutionary economic explanations of causation.”

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was changed to:

“This chapter proposed an evolutionary foundation for evolutionary economic explanations of causation.”

### **Chapter 4, *The Common Misconceptions*, first paragraph**

Changed “static world-view” to “marginalist world-view” and “dynamic world-view” to “managerial world-view.”

Changed second to last sentence,

“JIT manufacturing is much more than simply minimizing WIP inventories.”

to:

“‘True’ JIT manufacturing (as envisioned by Taiichi Ohno) is much more than simply minimizing WIP inventories.”

### **Chapter 5, Introduction, first paragraph, first sentence**

Changed “pharmaceutical biologist working” to “biologist searching for new medicines.”

### **Chapter 5, Avalanche Catastrophes, first paragraph, second sentence**

“Examples include the collapse of the Soviet Union and the dot.com speculative bubble.”

was changed to:

“Examples include the collapse of the Soviet Union and the bursting of the dot.com speculative bubble.”

### **Chapter 5, Avalanche Catastrophes, first paragraph, last two sentences**

“When adjustment is complete and immediate, no avalanches will occur. Ball bearings falling on a plane make complete and immediate adjustments and so will never create an avalanche.”

were deleted.

### **Chapter 5, Avalanche Catastrophes, last paragraph**

Added the sentence:



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“Ball bearings falling on a plane never produce avalanches.”

### **Chapter 6, Conclusion, first paragraph, second sentence**

Changed “(e.g., JIT manufacturing)” to “(e.g., the Toyota JIT system).”

### **Afterword, second to last paragraph, last sentence**

Changed “please themselves without considering others (libertarians)” to “consider liberty an end in itself rather than a means to justice (libertarians).”

### **Appendix, title**

Changed “Just-In-Time Manufacturing” to “The Toyota System.”

### **Appendix, Introduction, second paragraph**

Added the footnote:

“Much of the confusion about JIT manufacturing is due to the common misconception that it is a collection of techniques that minimize work-in-process inventory rather than the production system that creates these techniques. At Toyota, JIT manufacturing includes the learning-by-doing process that creates these techniques.”

### **Appendix, Introduction, third paragraph, fifth sentence**

Changed “Ohno’s” to “Toyota’s.”

### **Appendix, Introduction, third paragraph, second sentence**

Changed “Toyota executive” to “person” and changed “JIT manufacturing” to “the Toyota system.”

### **Appendix, Introduction, fourth paragraph**

“JIT manufacturing decomposes overwhelmingly complex manufacturing problems into smaller problems capable of being solved by production teams. The heart of JIT manufacturing is a simple, inexpensive, and robust means of controlling the flow of WIP inventory. This capability allows engineers and schedulers to provide partial solutions to complex problems. Partial solutions require excessive WIP inventory. Slowly reducing this inventory creates small problems. Line workers, supervisors, and production staff, working as a team, solve these problems, thereby solving the complex problem.”

was deleted.

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### Appendix, Shaping Constraints, first paragraph, second sentence

Changed “JIT manufacturing” to “The Toyota system.”

### Appendix, Shaping Constraints, first paragraph, last sentence

Changed “knowledge creation” to “learning-by-doing.”

### Appendix, The Elastic Production System, first paragraph, second sentence

Changed “such systems” to “batch production systems.”

### Appendix, The Elastic Production System, second paragraph

“The popular image of JIT manufacturing is that of a giant machine that **stretches across** dozens of factories owned by many different firms. Work-in-process flows so smoothly that it appears to be continuous production. This is the image that **Japanese manufacturers** like to show foreigners. What foreigners are not likely to see is **a JIT process before things are running so smoothly**. In many respects, this learning-by-doing process is even more impressive.”

was changed to:

“The popular image of **the Toyota JIT manufacturing system** is that of a giant machine that **encompasses** dozens of factories owned by many different firms. Work-in-process flows so smoothly that it appears to be continuous production. This is the image that **Toyota and its affiliates** like to show foreigners. What foreigners are not likely to see is **the learning-by-doing process that preceded smooth production**. In many respects, this learning-by-doing process is even more impressive.”

### Appendix, The Elastic Production System, third paragraph

“The JIT manufacturing control system is simple, flexible, and robust. By loosening production links, it can stretch to cover complex problems, e.g., those arising from simultaneously assembling different product lines on a single production line. Stretching the system in this manner increases the complexity of the production process. Tightening the loosened links one by one gradually turns the complex process back into a complicated one. In this way, JIT processes swallow and digest complex problems. This digestion process produces manufacturing technology in the form of improvements in product design, organization, procedures, and machine tools.”

was changed to:

“The Toyota system combines a simple, elastic, and robust means of linking production operations (*dual kanban*) with the guiding principle of continual improvement (*kaizen*). Metaphorically, it involves swallowing and digesting

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production problems that are too complex for production engineers to solve by themselves. By loosening production links, a Toyota system can stretch to accommodate these large problems. Gradually tightening the loosened links creates small production problems that members of the production team are able to solve. Solving these problems creates useful knowledge in the form of improved procedures, organization, machine tools, and product design. The learning-by-doing process ends when the complex (stretched) production system returns to being merely complicated.”

### **Appendix, The Elastic Production System, last paragraph**

Added the following paragraph and footnote:

“The balance of this section discusses the learning-by-doing process and a number of JIT manufacturing techniques from the early nineteen eighties.”

<sup>2</sup> Most of this material came from a seminar (Chicago, 1983) and a two week tour of JIT manufacturing plants (Japan, 1984) sponsored by The Cambridge Corporation, a Tokyo based management consulting firm founded by Masaaki Imai. Taiichi Ohno lectured at both Cambridge Corporation events.”

### **Appendix, Organization, Procedures, and Tools, first paragraph, first sentence**

Changed “JIT manufacturing” to “Toyota.”

### **Appendix, Organization, Procedures, and Tools, first paragraph**

Changed “JIT manufacturing” to “Toyota” in all.

### **Appendix, Organization, Procedures, and Tools, second paragraph, last sentence**

Changed ““multimachine manning.”” to “*multimachine manning.*”

### **Appendix, Production Links, last paragraph, first sentence**

Changed “JIT manufacturing system” to “Toyota JIT manufacturing system.”

### **Appendix, Production Links, last paragraph, second sentence**

Changed “JIT teams” to “Production teams.”

### **Appendix, Production Links, last paragraph, second sentence**

Changed “JIT teams” to “Production teams.”

### **Appendix, A Learning Attitude, last paragraph, last sentence**

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“**In lay terms**, they thrived by learning wisely.”

was changed to:

“**T**hey thrived by learning wisely.”

### **Appendix, Summary, last sentence**

Changed “JIT manufacturers” to “Toyota system team members.”

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### **Version 2002.10.28**

#### **Chapter 1, Marginalist Economics’ Blind Spot, sixth paragraph, fourth sentence**

Changed: “marginal cost and benefit” to “marginal cost and marginal benefit.”

#### **Chapter 1, Marginalist Economics’ Blind Spot, ninth paragraph, third sentence**

Inserted the sentence:

“The inexhaustibility of knowledge, the fact that using a pattern does not wear it out, makes determining the value of this knowledge problematic.”

#### **Chapter 1, Marginalist Economics’ Blind Spot, ninth paragraph, last sentence**

“The possibility of learning makes what otherwise would be a simple closed-ended problem into a complex open-ended one.”

was changed to:

“In general, determining the value of useful knowledge is an open ended problem. Thus, the possibility of learning makes what otherwise would be a simple closed-ended problem into a complex open-ended one.”

#### **Chapter 1, The Strategy, seventh paragraph, third sentence**

Changed: “deserve” to “warrant.”

#### **Chapter 1, fourth footnote**

“Although not generally recognized, the theoretical crisis created by this shortcoming has already arrived. Many economists have already accepted dynamic computer models that involve the fitness of economic agents. Such models concern what economic agents *need* (to become fit) rather than what they *want*. This contradicts the

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generally accepted belief that economics concerns *wants* rather than *needs*. Accepting these models requires redefining the field of economics.”

was deleted.

### Chapter 2, The Nature of Theories, first paragraph, first two sentences

“Toyota’s strategy for learning how to manufacture ever more wisely involves slowly tightening a loose production system. This chapter proposes a strategy for learning how to live ever more wisely, **which** involves slowly tightening a loose theory.”

was changed to:

“Toyota’s strategy for learning how to manufacture ever more wisely involves slowly tightening a loose production system **by removing ignorance in the form of work-in-process inventory**. This chapter proposes a **similar** strategy for learning how to live ever more wisely. **It** involves slowly tightening a loose theory **of means by removing ignorance in the form of theories of ultimate ends**.”

### Chapter 2, *Theories produce predictions and explanations of causation.*, first paragraph, last sentence, footnote 1

“Explanations of causation are not simply predictions “written backwards.” In *deterministic chaotic systems*, physicists can explain causation without being able to predict equally well. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate.” Further, quantum mechanics provides very accurate statistical predictions of subatomic events without explaining their causes equally well. Physicists currently seek better means of explaining, theories of what lies “beneath” or “behind” quantum mechanics, e.g., superstring theory, rather than better means of predicting what quantum mechanics predicts.”

was inserted as the second paragraph.

### Chapter 2, *Theories produce predictions and explanations of causation.*, new third paragraph, last two sentences

“**From the decision-oriented perspective of recursionist economics**, predictions help us evaluate **alternatives and** explanations help us find **them**. Better predictions help us become more *efficient* and better explanations help us become more *effective*.<sup>1</sup>”

<sup>1</sup> **Decision analysis consists of three basic steps: (1) defining alternatives, (2) defining the details necessary to evaluate alternatives, and (3) evaluating alternatives. Theories**

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that explain causation help us define alternatives. Theories that predict help us define the details necessary to evaluate alternatives. Specifically, they help us define the probabilities of uncertain events.”

was changed to:

“Predictions help us evaluate uncertain events, which helps us choose which of a set of given alternatives is the best solution to a given problem. In contrast, explanations help us find better problems to solve and better alternative solutions to given problems. Better predictions help us become more *efficient* and better explanations help us become more *effective*.”

### Chapter 2, *Theories are refinements of everyday thinking.*, second paragraph, first sentence

“We can start by classifying the process of knowing into sets.”

was changed to:

“We can start by classifying our ways of knowing into sets.”

### Chapter 2, A New Foundation for Explanation, second paragraph, first sentence

“The major reason the economics profession has failed to provide such theories is that most schools of economics claim that the primary purpose of economic theories is to predict, not explain explanation.”

was changed to:

“The primary reason the economics profession has failed to provide such theories is that most schools of economics claim that the purpose of economic theories is to predict, not explain explanation.”

### Chapter 2, A New Foundation for Explanation, third paragraph, fourth sentence

“To many who don’t believe this, it is merely an apology for current culture or despoiling the planet for the sake of producing ever more consumer goods.”

was changed to:

“To many who don’t believe this, it is merely an apology for current beliefs and behaviors.”

### Chapter 2, A New Foundation for Explanation, sixth paragraph, third sentence

Changed “evolving” to “evolving at a pace.”

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### **Chapter 2, A New Foundation for Explanation, seventh paragraph, first sentence**

“Although we can safely assume that we have fixed internal programming, we do not know, and may never know completely, what this internal programming is.”

was changed to:

“We do not know, and may never know completely, what this internal programming is.”

### **Chapter 2, A New Foundation for Explanation, new fourth footnote**

“<sup>4</sup>C. S. Pittendrigh coined ‘teleonomic’ to differentiate end directed biological theories from Aristotle’s end directed (teleological) theories. Teleonomic theories are positive in that they describe the world as it is: We are motivated to follow our internal programming. Teleonomic theories are also normative in that they prescribe what we ought to do: We *owe it to ourselves* to live good lives, which is the end we achieve by successfully following our programming. Thus, we *ought* to follow our internal programming. For more on the philosophical argument supporting this apparent contradiction of David Hume, see Adler, Mortimer, *Ten Philosophical Mistakes* (New York: Macmillan, 1985), Part 2.”

was deleted.

### **Chapter 2, A New Foundation for Explanation, last paragraph**

“The problem, once found, is obvious.”

was changed to:

“Explanations of causation based on the set of all acceptable teleonomic theories are unique in that they both describe what is and prescribe what ought to be. Specifically, they both describe the program that motivates us and prescribe that we owe it to ourselves (ought) to follow our programming. Doing so leads to happiness, a life well-lived.”<sup>5</sup>

“<sup>5</sup> Adler, Mortimer, *Ten Philosophical Mistakes* (New York: Macmillan, 1985), Part 2.”

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### **Acknowledgments, second paragraph, first three sentences**

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“The second is Howard Sherman, former counterintelligence agent, philosophy professor, corporate executive, entrepreneur, and **official unofficial philosopher of the Santa Fe Institute, now a consultant specializing in business strategy**. Howard introduced me to Einstein’s epistemology. In it I found a form of pragmatism (searching for useful truth) **more palatable to modern intellectuals and intelligent laymen** than the popular interpretation of William James’s pragmatism (recognizing truth by its usefulness).”

was changed to:

“The second is the late Howard Sherman, former counterintelligence agent, philosophy professor, corporate executive, entrepreneur, and **business consultant**. Howard introduced me to Einstein’s epistemology. In it I found a **more palatable** form of pragmatism (searching for useful truth) than the popular interpretation of William James’s pragmatism (recognizing truth by its usefulness).”

### Chapter 1, Modern Economics' Blind Spot, first paragraph, second sentence

“They belong to the class of resources that are patterns of matter, energy, space, and time.”

was changed to:

“They belong to the class of resources that are **useful** patterns of matter, energy, space, and time.”

### Chapter 1, Modern Economics' Blind Spot, sixth paragraph, fourth sentence

“Between these two extremes lies the **most** “economic” order quantity.”

was changed to:

“Between these two extremes lies the “economic” order quantity.”

### Chapter 1, Modern Economics' Blind Spot, tenth paragraph, eighth and ninth sentences

“Long setup times also increase waste: when production workers setup incorrectly, thirty or more days worth of parts need to be discarded. Further, they slow quality improvement by retarding feedback: it is much easier to remember the cause of a mistake made three hours ago than that of a mistake made three days ago.”

was changed to:

“Long setup times also increase waste: when production workers setup incorrectly, thirty or more days worth of parts **may** need to be **reworked or** discarded. Further, they



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slow **the pace of** quality improvement by retarding feedback: it is much easier to remember the cause of a mistake made three hours ago than that of a mistake made three days ago.”

### **Chapter 1, The Recursionist Strategy, fourth paragraph, first sentence**

“**The end of economics must change.**”

was changed to:

“**The **ultimate** end of economics must change.**”

### **Chapter 1, The Recursionist Strategy, fifth paragraph**

“In short, changing our concept of excellence in means to “efficiency and effectiveness” changes the global (universal) economic problem into one of how we, members of the community of beings capable of using the knowledge that we create, choose to progress toward our ultimate ends.”

was changed to:

“In short, changing our concept of excellence in means to “efficiency and effectiveness” changes the global (universal) economic problem into one of how we, **the** members of the community of beings capable of using the knowledge that we create, choose to progress toward our ultimate ends.”

### **Chapter 1, The Recursionist Strategy, seventh paragraph, first paragraph**

“The obvious choice for a process to apply recursively is decision-making, understood as the process that begins with finding a problem to solve and ends with **implementing** the chosen solution.”

was changed to:

“The obvious choice for a process to apply recursively is decision-making, understood as the process that begins with finding a problem to solve and ends with **evaluating the decision process.**”

### **Chapter 1, The Recursionist Strategy, seventh paragraph, second sentence;**

### **Chapter 2, A New Foundation for Explanation, first paragraph, second sentence**

“... formal decision-making consists of (1) finding a problem to solve, (2) identifying alternative solutions, (3) selecting an alternative, **and** (4) implementing the selected alternative.”

was changed to:

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“... formal decision-making consists of (1) finding a problem to solve, (2) identifying alternative solutions, (3) selecting an alternative, (4) implementing the selected alternative, and (5) evaluating the first four steps.”

### Chapter 2, *Theories are refinements of everyday thinking.*, second through seventh paragraphs

“We can start by classifying our ways of knowing into sets. The first set is the set of knowing that involves intuition. Because all knowing begins with intuition, this is the universal set of knowing. A good example of knowing that falls into this set and into no other set is that of an eyewitness who cannot describe a suspect’s face but can nevertheless identify it.

“The second set involves the process of expressing our intuitive knowledge as narratives that we use to predict or explain our sense experiences. An example of a predictive narrative is a technical analysis model of stock market behavior. An example of an explanatory narrative is the fable of the tortoise and the hare.

“The third set involves rejecting narratives that explain causation using rules and standards of construction. We call narratives that conform to the rules “logical” and those that conform to the standards “elegant” or “beautiful.” A major characteristic of beautiful theories is their ability to explain much while using few primary concepts and relations. Excessively complex theories, such as the fourteenth century scholastic theories attacked by William of Ockham, are “ugly.” After we reject illogical and ugly narratives that explain, we are left with philosophical theories.

“The fourth set involves rejecting philosophical theories based on how well they explain our sense experiences. The practical means of testing tools is to test their performance at the task we want them to perform. As logical and elegant narratives that explain causation, philosophical theories are tools for helping us find problems to solve. Thus, the practical means of testing philosophical theories is to test how well they help us find problems to solve. After we reject philosophical theories that do not meet our empirical criteria, we are left with scientific theories that explain causation. Classic examples are Darwin’s theory of evolution, which provides the foundation for biology, and plate tectonics, which does the same for geology.

“The fifth and final set involves rejecting narratives that predict based on how well they predict our sense experiences. After we reject those that do not meet our empirical criteria, we are left with scientific theories that predict. Good researchers distinguish between these theories and those that explain causation. When talking about theories that predict, they are careful to say that a set of factors *correlates with* rather than *causes* the result.

“This concept of science allows us to explain what happens in economies scientifically. To do so, we need agreement about the general nature of our ultimate

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ends and the means to test how well explanations help us find problems to solve. We currently lack both.”

were changed to:

“We can analyze everyday thinking by classifying worldly knowledge into sets based on the processes that we use to refine worldly knowledge. The most basic process, the process that separates knowing from not knowing something about the world, is the process of making an intuitive connection between our experiences and what we believe we know about the world. This intuitive process defines the universal set of knowledge about the world. A good example of worldly knowledge that falls into this set and into no other set is that of an eyewitness who cannot describe, but can nevertheless identify, a suspect’s face.

“We refine the universal set of worldly knowledge, (1), by rejecting all worldly knowledge that we cannot express as either words or symbols. What remains is the set of worldly narratives, (2). This set includes both narratives that help us predict the world and narratives that help us explain the world.

“We refine the set of all narratives that help us explain the world by rejecting those that fail to meet certain rules and standards of construction. We call narratives that conform to these rules “logical” and those that conform to these standards “elegant” or “beautiful.” What remains is the set of philosophical theories, (3).

“We refine the set of philosophical theories by rejecting those that fail to meet empirical standards for explaining our experiences. The practical means of testing tools is to test their performance at the task they were designed to perform. Thus, the practical means of testing philosophical theories is to test how well they help us find problems to solve. After rejecting philosophical theories that fail to meet our empirical criteria, we are left with the set of scientific theories that explain causation, (4). This set includes Darwin’s theory of evolution and Wegener’s theory of plate tectonics.

“We refine the set of narratives that predict by rejecting those that fail to meet empirical standards for predicting. What remains is the set of scientific theories that predict, (5). Good researchers distinguish between these scientific theories and those that explain causation. When talking about scientific theories that predict, they are careful to say that a set of factors *correlates with* rather than *causes* the result.”

### Chapter 2, A New Foundation for Explanation, fourth paragraph, third sentence

“The founder of Austrian economics, Carl Menger, chose to avoid this and other metaphysical problems in what was to become the traditional marginalist manner, which is to define ‘wealth’ as consumer goods and the resources to produce consumer goods.”

was changed to:

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“The founder of Austrian economics, Carl Menger, chose to avoid this and other metaphysical problems by defining ‘wealth’ as consumer goods and the resources to produce consumer goods.”

### Chapter 2, A New Foundation for Explanation, sixth paragraph, last two sentences

“It also tells us that our beliefs and behaviors are evolving at a pace many orders of magnitude faster than our internal programming. Therefore, we can safely assume that our **internal** programming is fixed.”

was changed to:

“It also tells us that our beliefs and behaviors are evolving at a pace many orders of magnitude faster than **the genetic level programming that underlies** our **higher level** internal programming. Therefore, we can safely assume that our **basic genetic** programming is fixed.”

### Chapter 5, Avalanche Catastrophes, second paragraph, second and third sentences

“Physicists call this phenomenon *self-organized criticality*. Experiments show that **small** sand piles are self-organized critical systems.”

was changed to:

“Physicists call this **weakly chaotic** phenomenon *self-organized criticality*. Experiments show that **some types of** sand piles are self-organized critical systems.”

### Chapter 5, Avalanche Catastrophes, fourth paragraph

“**Self-organized criticality is a weak form of chaos.** Weakly chaotic behavior is more predictable than is fully chaotic behavior. Uncertainty grows according to a power law for a weakly chaotic system, but exponentially for a fully chaotic one. If, for instance, it takes one hundred observations to predict two time units ahead, one thousand observations would allow us to predict twenty time units ahead for a weakly chaotic system, but only four time units ahead for a fully chaotic one.”

The first sentence was deleted and the rest was moved to beginning of the second footnote.

### Chapter 5, A Simple Model ..., first paragraph, last sentence

Appended the sentence:

“The system will create what appears to be (but isn't) an exploitable trade-off between transient inflation and unemployment, a Phillips curve.”

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### **Chapter 5, A Simple Model ..., new fourth footnote**

“This model predicts a chaotic phase space trajectory that creates what appears to be (but isn't) an exploitable trade-off between transient inflation and unemployment (a Phillips curve). It also predicts that economic avalanches will follow a power law. Note that these two predictions are based on assumption that people pursue happiness. Violating this assumption has two opposing effects on the level of turbulence. On the one hand, it tends to slow the rate of progress, which lowers the level of turbulence. On the other, it tends to increase economic viscosity, which raises the level of turbulence for a given rate of progress. The overall effect is to make the system less weakly chaotic, hence less predictable.”

was deleted.

### **Chapter 6, Moral Vision, last paragraph, last sentence**

“A clear moral vision helps us **to pursue the virtuous circle of accumulating wealth and accelerating change more quickly and surely.**”

was changed to:

“A clear moral vision helps us **cope with** accelerating change.”

### **Chapter 6, Just Taxation, first paragraph, second sentence**

“Just forms disrupt it in ways that promote progress.”

was changed to:

“Just forms disrupt it in ways that promote progress **by creating incentives to act wisely.**”

### **Chapter 6, Just Taxation, footnote**

“There are two major issues to consider. The first is whether we can trust policy makers to act justly. The second is whether policy makers have enough knowledge to act justly. Given the practical impossibility of ridding ourselves of unjust government programs, it is better to err on the side of less discretion.”

was deleted.

### **Chapter 6, Lucid Culture, title**

Changed “Lucid Culture” to “Fluid Relationships.”

### **Chapter 6, Fluid Relationships, first paragraph, second sentence**

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Changed “lucid culture” to “fluid relationships.”

### Chapter 6, Fluid Relationships, first paragraph, second sentence

“When lucidity prevails, we pursue happiness; when passion prevails, we pursue pleasure; and when dark inertia prevails, we pursue nothing.”

was changed to:

“When lucidity prevails, we pursue happiness; when passion prevails, we pursue pleasure; and when dark inertia prevails, we **accept our current circumstances and** pursue nothing.”

### Chapter 6, Fluid Relationships, third through ninth paragraphs

“We can tell many stories about why cultures become more hedonistic as they become more urban, industrial, and market-oriented. **Probably the best known stems from the Marxist belief that the predominant mode of production determines all. Industrialization lessened the demand for strong backs and increased the demand for skilled hands, creating the need for a new sort of “man,” the industrial worker. As industrialization progressed, economies of scale created the incentive for producers to use advertising to create mass markets for their products, which gave rise to a hedonistic “mass consumption” culture.**

“Another explanation is that as people moved away from their traditional homes and work they had the opportunity to choose an entirely new way of life. In the city, they were exposed to many new ways of living. Freed from tradition, they chose the ones that offered the most pleasure. Still another tells us that as people left agriculture for industry, their standard of living rose, which gave them more and greater opportunities to do as they pleased.

“Most likely there is an element of truth in each of these stories and in many others as well. The one thing that is certain is that no single explanation captures the whole truth about something this complex.

“There are those who believe that the information revolution is causing a cultural shift toward lucidity. Again, there are many stories that support this belief. The “predominant mode of production” story says that the demand for clever minds is increasing, creating the need for a wiser sort of “man,” the knowledge worker. Some producers have discovered that they can make and sell small quantities of their products efficiently, eliminating the need to create mass markets, hence, a “mass consumption” culture. A few firms have discovered that they can be even more successful if they can determine how best to help individual customers solve their problems, that is, to help them satisfy their needs.

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“Another story tells us that as the pace of change increases, people are forced to become ever wiser. Still others focus on how increased wealth, knowledge, and life spans lead to greater wisdom. Again, there is likely to be an element of truth in all of these stories, but none tell the whole truth.

“The question for just policy makers is not whether there is a trend toward lucidity, but how to promote such a trend. The immediate<sup>6</sup> answer is that policy makers should eliminate barriers to free (fluid) association, those things that make forming, changing, or dissolving relationships difficult or expensive.

“A good example of such a barrier in the United States is the tax-free status of employee insurance benefits. This supposed break for employees effectively takes away their right to buy insurance from whomever they please. It also involves employers, and through authoritarian progressive legislation, the government, in the personal lives of employees.”

“<sup>6</sup> Delving deeper returns us to our original question, what is the best learning strategy?”

was changed to:

“Just as we can tell many stories about why cultures become more hedonistic as they become more urban, industrial, and market-oriented, we can tell many stories about why cultures are likely to become more lucid as they become knowledge intensive. However, the practical question for just policy makers in information age economies is not whether there is a trend toward lucidity, but how to promote such a trend without dictating culture.

“Part of the solution to this difficult problem must be to eliminate barriers to fluid relationships, those things that make forming, changing, or dissolving relationships difficult or expensive. A good example of such a barrier in the United States is the tax-free status of employee insurance benefits. This supposed break for employees effectively takes away their right to buy insurance from whomever they please. It also involves employers, and through authoritarian progressive legislation, the government, in the personal lives of employees.”

### Chapter 6, Fluid Relationships, last paragraph

“In the long run, free association promotes lucidity by helping to spread practical wisdom.”

was changed to:

“In the long run, fluid relationships promote lucidity by allowing practical wisdom to flourish.”

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### Afterword, title

“America is great because America is good. When America ceases to be good, America will cease to be great.”

was changed to:

“Born often under another sky, placed in the middle of an always moving scene, himself driven by the irresistible torrent which draws all about him, the American has no time to tie himself to anything, he grows accustomed only to change, and ends by regarding it as the natural state of man. He feels the need of it, more he loves it; for the instability, instead of meaning disaster to him, seems to give birth only to miracles all about him.”

### Afterword, third to last paragraph

“Alexis de Tocqueville wrote “America is great because America is good. When America ceases to be good, America will cease to be great.” In a progressing world, goodness and greatness are moving targets. What made the United States great was a combination of classical liberal means and progressive ends. Maintaining this classical liberal, progressive tradition will ensure its greatness.”

was deleted.

### Afterword, second to last paragraph, second and third sentences

“**As such, it is the radical center of American politics.** Its supporters are those who seek to maintain the process that made America great (*process conservatives*).”

was changed to:

“Its supporters are those who seek to maintain the **dynamic** process that made the United States great (*process conservatives*).”

### Afterword 6, last paragraph

“Implicit in this call for progress and freedom is a warning not to confuse modernism with lucidity. The cultural journey from dark inertia to lucidity need not pass through hedonism.”

was deleted.



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## Chapter 6, Conclusion, second paragraph, last sentence

*“However, the case for decentralization itself depends on the assumption that we seek to live wisely.”*

was changed to:

“However, the case for decentralization itself depends on the assumption that we seek to live wisely: Decentralization is a means to the ultimate end of a good life for all, not an end in itself.”

## Chapter 6, Conclusion, third paragraph, last sentence

“The strategy put forth in this work aims to increase this propensity.”

was changed to:

“The strategy put forth in this work aims to increase this propensity **by providing a conceptual framework for thinking more clearly about our ultimate ends and the best means to them.**”

## Appendix, Introduction, third paragraph, last sentence

“Batches would flow like continuous production.”

was changed to:

“Batches of dissimilar parts would flow like continuous production of identical parts.”

## Appendix, Introduction, fourth paragraph, last sentence

“Instead, they developed a means of inventing manufacturing technology, which proved more useful in the long run.”

was changed to:

“Instead, they developed a means of inventing manufacturing technology, which, **due to the inexhaustibility of knowledge,** proved more **beneficial** in the long run.”

## Appendix, Organization, Procedures, and Tools, third paragraph

“The practice of restricting a person to one machine creates the dilemma of having to choose between complete automation and partial automation that speeds up the production rates. Because certain production operations are hard to automate,

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complete automation is often very expensive. On the other hand, partial automation that speeds up production rates creates uneven flow of work in process, which increases manufacturing complexity. The solution is assigning individual workers to more than one machine.”

was deleted.

### **Appendix, Organization, Procedures, and Tools, new fourth paragraph**

“Multimachine manning makes it possible to accumulate fractions of a full day’s work. This makes it possible to automate efficiently in small increments without wasting labor or creating uneven flows. It also makes adding and removing people from a process easier, which lowers both the cost of adjusting to fluctuations in production levels and the cost of inducing knowledge by removing people.”

was changed to:

“Multimachine manning makes it possible to accumulate fractions of a full day’s work. This makes it possible to automate in small increments without wasting labor or creating uneven flows. Automating in small increments makes it easier for production teams to target routine, difficult, and dangerous operations. Routine operations are the least costly to automate, difficult ones exhaust a full day’s work in less than a full day, and dangerous ones threaten precious human capital.”

“Multimachine manning also makes adding and removing people from a process easier, which lowers both the cost of adjusting to fluctuations in production levels and the cost of inducing knowledge by removing people.”

### **Appendix, Organization, Procedures, and Tools, new sixth paragraph**

“The incremental nature of this human centered approach to automation makes it easier for firms to target routine, difficult, and dangerous operations. Routine operations are the least costly to automate, difficult ones exhaust a full day’s work in less than a full day, and dangerous ones threaten precious human capital. Targeting these is both cost-effective and humane.”

was deleted.

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### **Preface, sixth paragraph, third sentence**

“My inspiration was Taiichi Ohno’s production strategy, which is popularly known as **Just-In-Time Manufacturing**.”

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was changed to:

“My inspiration was Taiichi Ohno’s production strategy, which is popularly known as *Just-In-Time Manufacturing, Lean Manufacturing, or, most accurately, The Toyota Production System.*”

### Chapter 1, seventh paragraph, last sentence

“Until **Just-In-Time manufacturing** became popular, it was common for standard procedures for setting up machine tools to remain unchanged for years, even decades.”

was changed to:

“Until **the Toyota manufacturing practice of rapid tool-setting** became popular, it was common for standard procedures for setting up machine tools to remain unchanged for years, even decades.”

### Chapter 5, Three Misconceptions, first paragraph, last sentences

“This cultural blindness was evident in many early American attempts to adopt **Just-In-Time (JIT) manufacturing**. **Many** American manufacturers perceived **JIT manufacturing** as a collection of techniques for minimizing WIP inventory. By adopting these techniques they thought they could catch up to their Japanese competitors. They soon discovered that by the time they adopted current Japanese techniques, the Japanese had developed new ones. **“True” JIT manufacturing (as envisioned by Taiichi Ohno)** is much more than simply minimizing WIP inventories. Early American failures to adopt JIT manufacturing warn us that this impressive means of inducing knowledge requires recognizing the possibility of improving the means of trade.”

was changed to:

“This cultural blindness was evident in many early American attempts to adopt **the Toyota Production System**. **Most** American manufacturers perceived **this system** as a collection of techniques for minimizing WIP inventory. By adopting these techniques they thought they could catch up to their Japanese competitors. They soon discovered that by the time they adopted current Japanese techniques, the Japanese had developed new ones. **The Toyota system** is much more than simply minimizing WIP inventories. Early American failures to adopt it warn us that this impressive means of inducing knowledge requires recognizing the possibility of improving the means of trade.”

### Chapter 6, Conclusion, first paragraph, second sentence

Changed “(e.g., the Toyota JIT system)” to “(e.g., the Toyota JIT system).”

### Appendix, first two paragraphs

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“Just-In-Time (JIT) manufacturing has become something of a joke among economists. Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to introduce the virtuous dynamic that drove early industrial age economies: the self-reinforcing combination of the division of labor and the expansion of market size. Like Smith’s pin factory, **JIT manufacturing** straddles two economic epochs. Where Smith’s pin factory combined pre-industrial age technology with industrial age batch manufacturing organization and management, **JIT manufacturing** combines industrial age batch manufacturing technology with something post-industrial. The joke is that economists cannot agree on what that something is.”

“What makes the **JIT manufacturing** system exemplary is its information age organization and management, which are based on the self-fulfilling belief that manufacturing processes produce production technology as well as saleable product. From this perspective, more “production” (of saleable product) is not necessarily more productive.<sup>1</sup>”

**“<sup>1</sup> Much of the confusion about the JIT manufacturing system is due to the common misconception that it is a collection of techniques that minimize work-in-process inventory rather than the production system that creates these techniques. At Toyota, JIT manufacturing includes the learning-by-doing process that creates these techniques.”**

was changed to:

“Just-In-Time Manufacturing/ **Lean Manufacturing / Toyota Production System** has become something of a joke among economists. Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to introduce the virtuous dynamic that drove early industrial age economies: the self-reinforcing combination of the division of labor and the expansion of market size. Like Smith’s pin factory, **the Toyota system** straddles two economic epochs. Where Smith’s pin factory combined pre-industrial age technology with industrial age batch manufacturing organization and management, it combines industrial age batch manufacturing technology with something post-industrial. The joke is that economists cannot agree on its name, much less what makes it exemplary.”

“What makes the **Toyota Production System** exemplary is its information age organization and management, which are based on the self-fulfilling belief that manufacturing processes produce production technology as well as saleable product. From this perspective, more ‘production’ (of saleable product) is not necessarily more productive.”

**Appendix, Introduction, third paragraph  
through The Elastic Production System, fourth paragraph**

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“In the early postwar years, Japan’s small market for trucks and Toyota’s lack of capital forced Toyota to produce trucks in small batches. Taiichi Ohno, the person most credited for inventing the Toyota system, recognized that Toyota could never catch up to the giant American firms by using traditional batch or mass production technology. Instead he envisioned a means of capturing the scale economies of mass production in Toyota’s small factories. Capturing scale economies without large scale appears paradoxical. As is often the case, this paradox disappears with a change in perspective. Toyota’s scale economies would come from producing large numbers of batches of differing goods rather than large numbers of identical goods. Batches of dissimilar parts would flow like continuous production of identical parts.

“Ohno’s imaginary factories required the knowledge of how to (1) reduce setup costs to insignificance, (2) achieve continuous production quality in batch production, (3) coordinate individual batch production processes precisely, and (4) maintain high rates of machine tool availability. Fortunately for Toyota, it was impossible for Ohno and his team to invent this knowledge directly. Instead, they developed a means of inventing manufacturing technology, which, due to the inexhaustibility of knowledge, proved more beneficial in the long run.

“Toyota first used this system to realize Ohno’s vision of equaling American production costs and quality while continuing to produce vehicles in relatively small quantities. Toyota and other Japanese firms have since used it to learn to build higher quality products at lower costs, build a large variety of products without raising costs, design easier to build products, and introduce new products quickly.

### **“Shaping Constraints**

“Like other forms of economic activity, manufacturing involves economic constraints. The Toyota system offers a new mix of constraints. It also provides a method for pushing back constraints by creating production technology. Understanding two of the factors that determine these constraints—the size of the production batch and the complexity of the manufacturing system—makes understanding this learning-by-doing process easier.

### **“Manufacturing Complexity**

“Production processes consist of separate operations such as cutting, grinding, printing, stamping, painting, bending, and welding. The movement and storage activities that connect two production operations form a *production link*. These links vary in both the amount and the variation of the amount of work in process that flows across them. A link is loose when the amount of work in process is great; tight when the amount is small; flexible when the variation in the amount of work in process is great; and rigid when it is small.

“Manufacturing systems can be simple, complicated, or complex. Simple systems are those that consists of a single production operation. Complicated systems are those that have more than one production operation but no flexible links. Complex systems are those that have at least one flexible link.

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“Complex systems are complex in that they involve many choices. The more choices they involve, the more complex they are. One measure of complexity is the number of the number of ways (modes) that we can operate the system. The problem with this measure is that the difference between these modes can be trivial. For example, the difference between operating a printing press at fifteen hundred impressions per minute and fifteen hundred and one impressions per minute is trivial. A more sophisticated measure of complexity is the number of ways that we can vary the system. In other words, we can measure the systems degrees of freedom, the number of coordinates it takes to describe the state of the system. Simple systems and complicated systems have only one degree of freedom. We can vary their speed but nothing else. In contrast, complex systems have this degree of freedom plus an additional degree of freedom for each of its flexible production links. We can vary not only their speed but also the amount of work-in-process inventory at each flexible production link.

### “**Batch Size**

“Production processes also vary by the number of identical items produced at one time. Some types of manufacturing facilities are good at producing small lots, others at producing large ones. At the low end of the spectrum is job shop (custom) manufacturing; at the high end is continuous process production.

“Traditional job shops have two major advantages, flexibility and low capital costs. Most use general-purpose machine tools grouped into departments by type or function. Work flows from department to department according to the demands of the job. Production links are flexible and loose. Capital costs tend to be low because general purpose machine tools permit operators to use the same tool to make a variety of parts and there is little machinery dedicated to transferring work in process from one operation to another. Offsetting these two advantages are high direct labor, waste, inventory, and indirect unit costs. Direct labor costs per unit are high because there is little automation and because workers require special skills, spend much time setting up machines, and waste time waiting for parts and work. Waste costs per unit are high because every machine setup is an opportunity to make mistakes. Inventory holding costs per unit are high because production links are loose. Indirect costs per unit are high because loose links require more scheduling, material handling, accounting, expediting, and supervising.

“Continuous production processes, such as paper mills and oil refineries, are essentially complicated machines dedicated to turning out large amounts of a narrow range of products with very few workers. Compared to traditional job shops, they sacrifice flexibility and capital to lower other costs.

“Between the two extremes of job shop and continuous process manufacturing is *batch production*. Some batch production operations are more like job shops; others are more like continuous processes.

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### “The Elastic Production System

“The Toyota JIT manufacturing system is a batch production system. Like other batch production systems, it combines characteristics of job shop and continuous process production. It uses tools intensively like a job shop, but its plant layout is similar to that of continuous processes. Like other batch production systems, production teams can vary its character by varying batch size. Unlike other batch systems, teams can easily vary the tightness of its production links.

“The popular image of the Toyota system is that of a giant machine that encompasses dozens of factories owned by many different firms. Work-in-process flows so smoothly that it appears to be continuous production. This is the image that Toyota and its affiliates like to show foreigners. What foreigners are not likely to see is the learning-by-doing process that preceded smooth production. For those who understand the Toyota system to be a means of producing production technology rather than simply a collection of techniques for minimizing WIP inventory, the learning-by-doing process is far more impressive.

“The Toyota system combines a simple, elastic, and robust means of linking production operations (*dual kanban*) with the guiding principle of continual improvement (*kaizen*). Metaphorically, it involves swallowing and digesting production problems that are too complex for production engineers to solve by themselves. By loosening production links, a Toyota system can stretch to accommodate these large problems. Gradually tightening the loosened links creates small production problems that members of the production team are able to solve. Solving these problems creates useful knowledge in the form of improved procedures, organization, machine tools, and product design. The learning-by-doing process ends when the complex (stretched) production system returns to being merely complicated.

“The balance of this section discusses the learning-by-doing process and a number of JIT manufacturing techniques from the early nineteen eighties.”

was changed to:

### “Ever Leaner Manufacturing

“In the early postwar years, Japan’s small market for trucks and Toyota’s lack of capital forced Toyota to produce trucks in small batches. Taiichi Ohno, the person most credited for inventing the Toyota system, recognized that Toyota could never catch up to the giant American firms by using traditional batch or mass production technology. Instead he envisioned a means of capturing the scale economies of mass production in Toyota’s small factories. Capturing scale economies without large scale appears paradoxical. As is often the case, this paradox disappears with a change in perspective. Toyota’s scale economies would come from producing batches of similar goods rather than large numbers of identical goods. Batches of similar parts would flow like continuous production of identical parts.

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“Ohno’s imaginary factories required the knowledge of how to (1) reduce setup costs to insignificance, (2) achieve continuous production quality in batch production, (3) coordinate production precisely, which is to say, reduce work-in-process inventory to the absolute minimum, and (4) maintain high rates of machine tool availability. Fortunately for Toyota, it was impossible for Ohno and his team to invent this knowledge directly. Instead, they developed a means of inventing manufacturing technology, which, due to the inexhaustibility of knowledge, proved more beneficial in the long run.

“Toyota first used this system to realize Ohno’s vision of equaling American production costs and quality while continuing to produce vehicles in relatively small quantities. Toyota and other Japanese firms have since used it to learn to build higher quality products at lower costs, build a large variety of products without raising costs, design easier to build products, and introduce new products quickly.

“Those seeking to explain Toyota’s success have provided a wide variety of explanations. This appendix provides yet another. The essence of the Toyota Production System is the ongoing process of folding a continuous process manufacturing system in on itself and then smoothing out the resulting wrinkles. The result of this ongoing process is an ever leaner manufacturing system. Understanding this explanation requires understanding why changing batch sizes affects the shape of traditional manufacturing systems.

### “**Traditional Manufacturing Systems**

“Traditional manufacturing systems consist of a series of separate production operations. These operations include such things as cutting, grinding, printing, stamping, painting, bending, assembling, sewing, gluing, riveting, soldering, and welding. The movement and storage activities that connect production operations form *production links*. Some of these links are *rigid* in that they provide those operating the production system no choice. Others are *flexible* in that they allow production operators (production schedulers, supervisors, and line workers) the choice of where the output of the operation flows.

“The simplest production systems are simple in form and in operation. They are simple in form in that they consist of a single operation. They are simple in operation in that operators only face one choice, the rate at which the production system produces.

“Other production systems are complex in form but simple in operation. They are complex in form in that they consist of more than one production operation. They are simple in operation in that operators only face one choice, the rate at which the production system produces. They consist of production operations rigidly linked together into what is essentially a single complicated machine. These systems contain no flexible production links.



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“Still other production operations are complex in both form and operation. These systems contain at least one flexible production link.

“The traditional means of classifying production systems is by batch size, the number of identical items produced at one time. Batch sizes range from one to infinity. At the low end of this scale is *custom manufacturing*. At the high end of the scale is *continuous process manufacturing*. Between the two extremes is *batch production*. Batch production systems near the low end of the scale are more like custom manufacturing; those near the high end of the scale are more like continuous process manufacturing.

“Traditional custom manufacturing, which is commonly known as job shop manufacturing, has two major advantages, flexibility and low capital costs. Most job shops use general-purpose machine tools grouped into departments by type or function. Work flows from department to department according to the demands of the job. Capital costs tend to be low because general purpose machine tools permit operators to use the same tool to make a variety of parts and there is little machinery dedicated to transferring work in process from one operation to another. Offsetting these two advantages are high direct labor, waste, inventory, and indirect unit costs. Direct labor costs per unit are high because there is little automation and because workers require special skills, spend much time setting up machines, and waste time waiting for parts and work. Waste costs per unit are high because every machine setup is an opportunity to make mistakes. Inventory holding costs per unit are high because production links are loose. Indirect costs per unit are high because the ad hoc links connecting production operations require more scheduling, material handling, accounting, and supervising. Traditional custom manufacturing is complex both in form and in operation.

“In contrast, continuous manufacturing processes, such as paper mills and oil refineries, are essentially complicated machines dedicated to turning out large amounts of a narrow range of products with very few workers. They are complex in form but not in operation. Compared to traditional custom manufacturing, they sacrifice flexibility and capital in order to lower other costs.

### “***Folding in Production Operations***”

“Imagine a world in which operational simplicity always trumps capital equipment and labor costs. In this imaginary world, all manufacturing would be river-like continuous processes producing a single type of product. There would be no intermingling of parts or subassembly production. If each of the four wheels requires five wheel bolts, there are twenty identical wheel bolt subassembly production lines. Further, there would be no intermingling of finished goods production. If the market demands a single pink limousine per year, a firm would produce it on a freestanding pink limousine production line.

“In the real world total production system designers must balance the costs of operational simplicity, capital equipment, and labor. Wise designers lower capital and

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labor costs without increasing operational complexity by grouping the production of identical parts together while maintaining a rigid link to the rest of the production process. Metaphorically, they fold in identical parts of the river-like continuous manufacturing process on top of each other.

“Production system designers can also fold in similar parts of manufacturing process on top of each other. This requires batching the production of identical parts using machine tools capable of producing a variety of similar parts. Producing in batches makes the most of capital equipment. However, it requires additional labor and increased operational complexity. Someone needs to decide the size of the batch. In job shops, someone also needs to decide where each batch goes next.

“For the folding in of similar parts of the manufacturing process on top of each other to be wise, the benefits of lowering capital equipment costs must overwhelm the costs associated with increasing labor and operational complexity. The lower the production rate, the greater the relative benefits of lowering capital equipment costs become. Taking this argument to its logical limit, a traditional job shop is simply countless continuous process manufacturing lines folded in to a small space.

### “*Smoothing Flows*

“The popular image of the Toyota system is that of a giant machine that encompasses dozens of factories owned by many different firms. WIP flows so smoothly that it appears to be continuous production. This is the image that Toyota and its affiliates like to show foreigners. What foreigners are not likely to see is the learning-by-doing process that preceded smooth production. For those who understand the Toyota system to be a means of producing production technology rather than simply a collection of techniques for minimizing WIP inventory, this smoothing process is far more impressive.

“The Toyota system is a batch production system. Like other batch production systems, it combines characteristics of custom and continuous process manufacturing. It uses tools intensively like a job shop, but its plant layout is similar to that of continuous processes. Like other batch production systems, production teams can vary its character by varying batch size. Unlike other batch systems, teams can easily vary the tightness of its production links.

“The Toyota system combines a simple, elastic, and robust means of linking production operations (*dual kanban*) with the guiding principle of continual improvement (*kaizen*). The elasticity of the dual kanban production links allows the production system to stretch to fit problems that are too complex for production engineers to solve by themselves, the kind of problems created by folding in large parts of a production system. The production engineers’ ignorance of how to make the system work smoothly manifests itself as excessive WIP inventory stored in stretched production links. The production team renders this ignorance by gradually tightening the stretched links. Tightening these links creates small production problems that team members are able to solve. Solving these problems creates useful knowledge in the

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form of improved procedures, organization, machine tools, operator training, manufacturing quality, and product design. Applying this new knowledge eliminates the need for excessive WIP inventory, thereby restoring the stretched production link

“The benefits of smooth flow do not stop at the end of the production line. The Toyota system maintains a smooth flow of finished goods to the customer by setting the production rate to the rate that customers demand products. Metaphorically, customer purchases pull work-in-process (WIP) through the production system. In theory, there is only a single operating mode: on. In practice, varying the production rate may require building discretionary reserve capacity into the system, which increases operational complexity. The benefits of smooth flow do not stop at the end of the production line. The Toyota system maintains a smooth flow of finished goods to the customer by setting the production rate to the rate that customers demand products. Metaphorically, customer purchases pull work-in-process (WIP) through the production system. In theory, there is only a single operating mode: on. In practice, varying the production rate may require building discretionary reserve capacity into the system, which increases operational complexity.

### “Manufacturing Techniques

“Toyota manufacturing techniques evolve over time. However, the underlying principles remain relatively constant. The following describes some of the techniques Toyota, its suppliers, and its Japanese imitators were using in the early nineteen eighties.”

### Appendix, Production Links, first paragraph, first sentence

“Understanding **Toyota’s version of JIT manufacturing fully** requires understanding the two ways the system links production operations.”

was changed to:

“Understanding **the Toyota Production System** requires understanding the two ways the system links production operations.”

### Appendix, Summary, last sentence

“To Toyota **system** team members, it is common sense.”

was changed to:

“To Toyota **production** team members, it is common sense.”

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## Chapter 2, Title, quote

Added the Max Planck quote:

“Science... means unrelenting endeavor and continually progressing development toward an end which the poetic intuition may apprehend, but which the intellect can never fully grasp.”

## Appendix, Introduction, first paragraph, second sentence

“Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to introduce the virtuous **dynamic that drove early industrial age economies: the self-reinforcing combination** of the division of labor and the expansion of market size.”

was changed to:

“Many believe that it represents the early information age equivalent of Adam Smith’s early industrial age pin factory, which Smith used to introduce the virtuous **circle** of the division of labor and the expansion of market size.”

## Appendix, Introduction, second paragraph

“What makes the Toyota Production System exemplary is its information age organization and management, which **are based on the self-fulfilling belief that manufacturing processes produce production technology as well as saleable product.** From this perspective, more ‘production’ (of saleable product) is not necessarily more productive.”

was changed to:

“What makes the Toyota Production System exemplary is its information age organization and management, which **focuses on continual improvement (kaizen) in production, trade, and consumption. It is the epitome of learning-by-doing.** From this **information age** perspective, more production of saleable product is not necessarily more productive. **Less ‘production’ can be more productive.**”

## Appendix, Ever Leaner Production, fourth paragraph

“Those seeking to explain Toyota’s success have provided a wide variety of **explanations. This appendix provides yet another.** The essence of the Toyota Production System is the ongoing process of folding a continuous process manufacturing system **in** on itself and then smoothing out the resulting wrinkles. The result of this ongoing process is an ever leaner manufacturing system. Understanding this explanation requires understanding **why changing batch sizes affects the shape of traditional manufacturing systems.**”

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was changed to:

“The essence of the Toyota Production System is the ongoing process of folding in a continuous process manufacturing system on itself and then smoothing out the resulting wrinkles. The result of this ongoing process is an ever leaner manufacturing system. Understanding this explanation requires understanding a bit about the trade-offs involved in designing production systems.”

### Appendix, Traditional Manufacturing Systems, first paragraph, last sentence

“Others are *flexible* in that they allow production operators (production schedulers, supervisors, and line workers) the choice of where the output of the operation flows.”

was changed to:

“Others are *flexible* in that they allow production team members the choice of when and where the output of the operation flows.”

### Appendix, Traditional Manufacturing Systems, second paragraph, last sentence

“They are also simple in operation in that operators only face one choice, the rate at which the operation produces.”

was changed to:

“They are also simple in operation in that operators only face one choice, the rate at which the production system produces.”

### Appendix, Production Links, last two paragraphs

“A team also can lower WIP inventory by reducing batch sizes. For a given production level, reducing batch sizes requires setting up machines more frequently and moving more containers. The main benefit is flexibility.

“In summary, the Toyota system connects operations tightly into tasks within work centers and connects work centers with elastic kanban links. Reducing WIP inventory by removing kanbans increases labor efficiency and product quality, which are advantages of continuous process manufacturing. In contrast, reducing WIP inventory by decreasing batch size increases flexibility, which is an advantage of job shop production.”

were deleted.

### Appendix, fourth footnote, last sentence

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“While learning to produce using fewer kanban makes a **batch production process** more like a continuous **one**, learning to produce using smaller batch sizes makes a **batch production process** more like a job shop.”

was changed to:

“While learning to produce using fewer kanban makes a **Toyota system** more like continuous **process manufacturing**, learning to produce using smaller batch sizes makes **it** more like **custom manufacturing**.”

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### Version 2002.12.05

#### Preface, fifth paragraph, second sentence

“In economies with the potential for rapid change, **the potential interactions between ethics and modern economics, between the studies of how we progress toward our ultimate ends and how we use scarce resources to satisfy our wants**, are too important to ignore.”

was changed to:

“In economies with the potential for rapid change, **the potential interactions between the studies of how we progress toward our ultimate ends and how we use scarce resources to satisfy our wants, between ethics and modern economics**, are too important to ignore.”

#### Preface, sixth paragraph, second sentence

“My inspiration was Taiichi Ohno’s production strategy, **which is popularly known as *Just-In-Time Manufacturing, Lean Manufacturing*, or, most accurately, *The Toyota Production System***.”

was changed to:

“My inspiration was Taiichi Ohno’s production strategy.”

#### Preface, sixth paragraph, fifth sentence

“I see intelligent beings’ **ethical/economic/political** problem as one of progressing toward our ultimate ends *and of learning how to progress toward our ultimate ends ever more efficiently*.”

was changed to:

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“I see intelligent beings’ **global** problem as one of progressing toward our ultimate ends *and of learning how to progress toward our ultimate ends ever more efficiently.*”

## Chapter 1, Modern Economics Blind Spot, fifth paragraph, first sentence

“Concepts focus our attention on certain characteristics of objects, **causing** us to ignore other characteristics.”

was changed to:

“Concepts focus our attention on certain characteristics of objects, **which causes** us to ignore other characteristics.”

## Chapter 2, title

Added Planck quote.

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Version 2002.12.12

## Preface, end

Inserted the paragraph:

“The idea of replacing a theory with a strategy for creating knowledge will remind many economists of George Stigler’s maxim on methodology: “Theories are not rejected by circumstantial evidence: it takes a theory to beat a theory.” I argue that Stigler defined the market for academic thinking too narrowly. He got the second half of his maxim wrong: it takes an intellectual tool for creating knowledge to beat an intellectual tool for creating knowledge. The relevant market is not for theories but rather for intellectual tools for creating useful knowledge.”

## Acknowledgments, second paragraph, second sentence

“In it I found a more palatable form of pragmatism (searching for useful truth) than the popular interpretation of William James’s pragmatism (recognizing truth by its usefulness).”

was deleted.

## Chapter 1, The Recursionist Strategy, fourth paragraph, first two sentences

Changed “**evaluating** the decision process” to “**reviewing** the decision process.”

Changed “**evaluating** the first four steps” to “**reviewing** the first four steps.”

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## Chapter 1, Overview, fourth sentence

Changed “on which the **foundation is based**” to “on which the **strategy rests**.”

## Chapter 2, title

Deleted Planck quote.

## Chapter 2, A New Foundation for Explanation, first paragraph, second

Changed “**evaluating** the first four steps” to “**reviewing** the first four steps.”

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## Version 2002.12.30

### Preface, last paragraph, third sentence

“**I argue that** Stigler defined the market for academic thinking too narrowly.”

was changed to:

“Stigler’s **conventional epistemology led him to** define the market for academic thinking too narrowly.”

### Preface, end

Inserted the paragraphs:

“The reason that economists must broaden their market from theories to strategies is that those looking for ethical/economic/political theories have failed to provide us with the universal ethical theory that the life sciences tells us must exist: We all share a common design for life. Should we not, in theory, share the same basic plan for how best to develop this design?”

“Our ethical/economic/political problem is far too complex for any one academic discipline, much less any one academic. Thomas Sowell has likened economists’ efforts to solve it to a drunk looking for his car keys under a lamppost. When asked why he confines his search to under the lamppost, the drunk replies that that is where the light is. The implication is that economists search where their theoretical tools allow them to search, not where it is most productive to search.

“Discovering what is in the light (Kuhn’s ordinary science) is part of the solution to our ethical/economic/political problem. Developing sources of light (Kuhn’s extraordinary science) is another part. So is developing strategies for how all of us, working as a team, can best search the darkness (knowledge management).”



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**Version 2002.12.31**

## **Preface, last four paragraphs**

“The idea of replacing a theory with a strategy for creating knowledge will remind many economists of George Stigler’s maxim on methodology: “Theories are not rejected by circumstantial evidence: it takes a theory to beat a theory.” Stigler’s conventional epistemology led him to define the market for academic thinking too narrowly. He got the second half of his maxim wrong: it takes an intellectual tool for creating knowledge to beat an intellectual tool for creating knowledge. The relevant market is not for theories but rather for intellectual tools for creating useful knowledge.

“The reason that economists must broaden their market from theories to strategies is that those looking for ethical/economic/political theories have failed to provide us with the universal ethical theory that the life sciences tells us must exist: We all share a common design for life. Should we not, in theory, share the same basic plan for how best to develop this design?

“Our ethical/economic/political problem is far too complex for any one academic discipline, much less any one academic. Thomas Sowell has likened economists’ efforts to solve it to a drunk looking for his car keys under a lamppost. When asked why he confines his search to under the lamppost, the drunk replies that that is where the light is. The implication is that economists search where their theoretical tools allow them to search, not where it is most productive to search.

“Discovering what is in the light (Kuhn’s ordinary science) is part of the solution to our ethical/economic/political problem. Developing sources of light (Kuhn’s extraordinary science) is another part. So is developing strategies for how all of us, working as a team, can best search the darkness (knowledge management).”

were changed to:

“To those who define the markets for intellectual tools to exclude everything but theories, it takes a theory to beat a theory. To those who define these markets to include strategies for creating useful knowledge, it takes an intellectual tool to beat an intellectual tool. Who defines these markets? In the market for intellectual production tools, the customers decided that Toyota’s early information age production strategy was better than late industrial age production theories. The strategy beat the theories.”

## **Chapter 2, *Theories produce predictions and explanations of causation*, third paragraph, second and third sentences**

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“Predictions help us evaluate uncertain events, which helps us **choose which of a set of given alternatives is the best solution to a given problem**. In contrast, explanations help us find better problems to solve **and better alternative solutions to given problems**.”

was changed to:

“Predictions help us evaluate uncertain events, which helps us **evaluate** alternatives. In contrast, explanations help us find better problems to solve.”

### Chapter 4, title, quotation

“Men who are lucid go upward;  
men of passion stay in between;  
men of dark inertia,  
caught in vile ways, sink low.”  
— *The Bhagavad-Gita*

was changed to:

“It is better to know nothing than to know what ain’t so.” — *Josh Billings*

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## Changes in Version 2003.01.20

### Preface, eleventh paragraph, first two sentences

“**Toyota engineers are part of the system that they are designing. Similarly,** economists are part of the system that they are studying.”

was changed to:

“**The first lesson economists can learn from Toyota is that** economists are part of the system that they are studying.”

### Preface, thirteenth paragraph, third sentence

“In contrast, I advocate theories that explain causation.”

was changed to:

“In contrast, I advocate **both theories that predict and those that explain causation. Academics are used to looking at the market for intellectual tools from the supply side. As someone who has spent most of his working life outside of the academy, I look at**

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it both from the supply and the demand side. From the demand side, all economic agents need both theories that predict and theories that explain causation.”

### Preface, thirteenth paragraph

Inserted the following paragraphs:

“A major unintended consequence of Friedman’s famous essay on methodology is that it has retarded the acceptance of strategic theories that explain causation such as those of Ludwig von Mises, F. A. Hayek, and other modern Austrian economists. Without such theories, neoclassical economics goes unchecked. Thoughtless neoclassical practitioners ignore Alfred Marshall’s warnings about the proper use of the tools in his partial equilibrium analysis toolbox. Worse, most economic agents use neoclassical concepts without recognizing either their source or their limitations.

“The problem is that theories that help us predict and those that help us explain causation ought to have different foundations. To be effective, theories that help us predict must be based *on what people will do*. In contrast, theories that help us explain causation must be based *on what the wise would do*. Only a fool would use a theory that tells him what problem the average person would choose to solve.

“Modern Austrian economics also falls short as a tool for helping us find better problems to solve. Modern Austrian economists ignore important interactions between ethics (how we live good lives) and modern economics (how we satisfy our wants). Whether it is the ability to read, write, calculate, operate a motor vehicle, use a computer, learn quickly, communicate clearly, think logically, or behave continently, useful knowledge does not recognize the boundaries that separate “consumption” from “production” and “trade.” The inappropriate assumption of a barrier separating these supposedly separate spheres of human action disconnects modern Austrian economics from the (non-human) life sciences.

“The second lesson economists can learn is that quality is as much a matter of satisfying customer needs as it is conforming to philosophical and scientific standards. How can economists satisfy customer needs when economic agents themselves don’t know exactly what their needs are? Economists can provide strategies for helping economic agents identify their needs.”

### Preface, last paragraph, last sentence

Added the paragraph:

“Human cultures evolve most readily when individual humans decide wisely. Wise decision-making is as much a matter of choosing the best problem to solve (effectiveness) as it is of choosing the best alternative to a given problem (efficiency). We need theories that explain what happens in economies as well as those that predict what will happen in markets.”

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## Chapter 4, title, quotation

“It is better to know nothing than to know what ain’t so.” — *Josh Billings*

was changed back to:

“Men who are lucid go upward;  
men of passion stay in between;  
men of dark inertia,  
caught in vile ways, sink low.”

— *The Bhagavad-Gita*

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## Changes in Version 2003.01.24

### Preface, eleventh paragraph, first sentence

“The first **lesson economists can learn from Toyota** is that economists are part of the system that they are studying.”

was changed to:

“**Economists can learn two lessons from Toyota manufacturing engineers.** The first is that economists are part of the system that they are studying.”

### Preface, fourteenth to sixteenth paragraphs

“A major unintended consequence of Friedman’s famous essay on methodology is that it has retarded the acceptance of **strategic** theories that explain causation **such as those of Ludwig von Mises, F. A. Hayek, and other modern Austrian economists.** Without such theories, neoclassical economics **goes unchecked.** Thoughtless neoclassical practitioners ignore Alfred Marshall’s warnings about the proper use of the tools in his partial equilibrium analysis toolbox. Worse, **most** economic agents use neoclassical concepts without recognizing either their source or their limitations.

**The problem is that** theories that help us predict and those that help us explain causation ought to have different foundations. To be effective, theories that help us predict must be based *on what people will do*. In contrast, theories that help us explain causation must be based *on what the wise would do*. Only a fool would **use a theory that tells him what problem the average person would choose to solve.**

Modern Austrian economics **also falls short as a tool for helping us find better problems to solve.** Modern Austrian economists ignore important interactions between **ethics (how we live good lives) and modern economics (how we satisfy our wants).** Whether it is the ability to read, write, calculate, operate a motor vehicle, use a

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computer, learn quickly, communicate clearly, think logically, or behave continently, useful knowledge does not recognize the boundaries that separate “consumption” from “production” and “trade.” **The inappropriate assumption of a barrier separating these supposedly separate spheres of human action disconnects modern Austrian economics from the (non-human) life sciences. It is not the best tool for helping us find better problems to solve.”**

were changed to:

“A major unintended consequence of Friedman’s famous essay on methodology is that it has retarded the acceptance of theories that explain causation. Without such theories, neoclassical economics **expands into the strategic sphere of helping us find better problems to solve.** Thoughtless neoclassical practitioners ignore Alfred Marshall’s warnings about the proper use of the tools in his partial equilibrium analysis toolbox. Worse, economic agents use neoclassical concepts **without realizing their limitations as tools for finding problems to solve.**

Theories that help us predict and those that help us explain causation ought to have different foundations. To be effective, theories that help us predict must be based *on what people will do*. In contrast, theories that help us explain causation must be based *on what the wise would do*. Only a fool would **choose a theory for finding problems to solve based on what the average person has chosen in the past.**

Modern Austrian economic **theories explain causation. Unfortunately, they share the same subjectivist foundation as marginalist economic theories. Like marginalist theories, they fail to include** important interactions between “consumption” and “productive activities.” Whether it is the ability to read, write, calculate, operate a motor vehicle, use a computer, learn quickly, communicate clearly, think logically, or behave continently, useful knowledge does not recognize the boundaries that separate “consumption” from “production” and “trade.” **Worse, they fail to include the potential virtuous circle involving excellence in “consumption” and “productive activities.” Arguably, this potential virtuous circle is as important to information age economies as the potential virtuous circle involving the division of labor and the expansion of market size was to the industrial age economies.”**

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### Changes in Version 2003.02.07

#### Preface, fourteenth paragraph

“**A major unintended consequence of** Friedman’s famous essay on methodology **is that** it has retarded the acceptance of theories that explain causation. **Without such theories,** neoclassical economics **expands into the strategic sphere of helping us find better problems to solve.** Thoughtless neoclassical practitioners ignore Alfred Marshall’s warnings about the proper use of the tools in his partial equilibrium analysis toolbox.

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Worse, economic agents use neoclassical concepts without realizing their limitations as tools for finding problems to solve.”

was changed to:

“A major problem with Friedman’s *Essays in Positive Economics* is that it has retarded the acceptance of theories that explain causation. The most prominent of these are evolutionary theories. In his intellectual autobiography, evolutionary economist F. A. Hayek wrote:

“[O]ne of the things I most regret is not having returned to a criticism of Keynes’s treatise, but it is as much true of not having criticized Milton Friedman’s [*Essays in*] *Positive Economics*, which in a way is quite as dangerous a book.”

Friedman and his followers have created a theoretical vacuum. Foolish practitioners of neoclassical economics have rushed in to fill this vacuum. Worse, economic agents use neoclassical concepts without understanding their limitations as tools for finding problems to solve.”

### Preface, sixteenth paragraph, first sentence

“Modern Austrian economic theories explain causation.”

was changed to:

“Modern Austrian economics’ evolutionary theories are the leading candidates for explaining causation.”

### Preface, sixteenth paragraph, last sentence

“Arguably, this potential virtuous circle is as important to information age economies as the potential virtuous circle involving the division of labor and the expansion of market size was to the industrial age economies.”

was changed to:

“Just as recognizing Adam Smith’s potential virtuous circle involving the division of labor and expansion of market size is key to understanding the dynamics of industrial age economies, recognizing the potential virtuous circle involving excellence in “consumption” and “productive activities” is key to understanding the dynamics of information age economies.”

### Acknowledgments, last paragraph, last two sentences

“Although I finished my first draft before reading any of his works, I owe more to this self-proclaimed member of “the party of life” than to any other economist. Some day I

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hope to honor him more fully with an essay titled *Why I Am Not a Libertarian* to compliment his essay, *Why I Am Not a Conservative*.”

was changed to:

“Although I finished my first draft before reading any of his works, I owe more to Hayek than to any other economist. In the Afterword of *The Constitution of Liberty*, this self-proclaimed member of the party of life explained why he was neither a conservative nor a libertarian. Understanding this essay helped me understand the dynamic balance of progress and freedom that made America great. In the Afterword of this book, I explain why I am a classical liberal progressive, by which I mean someone who advocates classical liberal means and ever more inclusive ends.”

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### Changes in Version 2003.02.14

#### Preface, last paragraph, last sentence

Added the following:

“Further, human cultures evolve most readily, and peaceably, when there is a free exchange of ideas about our ultimate ends and the best means to them. We need a common conceptual framework for thinking about our ultimate ends and the best means to them. A good economic strategy provides both theories that explain what happens in economies and a common conceptual framework for thinking about our ultimate ends and the best means to them.”

#### Acknowledgements, second paragraph, last two sentences

“Howard introduced me to Einstein’s epistemology. Howard freed me from the dogmatism of “Great Books’ humanism.””

was changed to:

“Howard introduced me to Einstein’s epistemology, thereby freeing me from the dogmatism of Great Books’ humanism.”

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### Changes in Version 2003.05.01

#### Preface, thirteenth paragraph, second through ninth sentences

“In this most cited economics paper, Friedman advocates theories that predict. In contrast, I advocate both theories that predict and those that explain causation.

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Academics are used to looking at the market for intellectual tools from the supply side. As someone who has spent most of his working life outside of the academy, I look at it both from the supply and the demand side. From the demand side, all economic agents need both theories that predict and theories that explain causation. Theories that predict help us solve given problems. Theories that explain causation, such as Darwin's theory of evolution and Wegener's theory of plate tectonics, help us find better problems to solve."

was changed to:

"In this most cited economics paper, Friedman states that economists ought to produce theories that help us predict and tautological classification schemes. In contrast, I claim that economists ought to produce intellectual tools that help us predict and intellectual tools that help us explain causation. Intellectual tools that help us predict are useful in that they help us solve given problems. Intellectual tools that help us explain causation, such as Darwin's theory of evolution and Wegener's theory of plate tectonics, are useful in that they help us find better problems to solve."

### Preface, sixteenth paragraph

"Theories that help us predict and those that help us explain causation ought to have different foundations. To be effective, theories that help us predict must be based *on what people will do*. In contrast, theories that help us explain causation must be based *on what the wise would do*. Only a fool would choose a theory for finding problems to solve based on what the average person has chosen in the past."

was changed to:

"Intellectual tools that help us predict and those that help us explain causation ought to have different foundations. To be effective, tools that help us predict must be based *on what people will do*. In contrast, tools that help us explain causation must be based *on what the wise would do*. Only a fool would choose a tool for finding problems to solve based on what the average person has chosen in the past."

### Preface, last paragraph, fifth sentence

"We need a common conceptual framework for thinking about our ultimate ends and the best means to them."

was changed to:

"We need a common classification system, a common conceptual framework, for thinking about our ultimate ends and the best means to them."



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## Changes in Version 2003.05.08

### Preface, thirteenth through fifteenth paragraphs

“This instrumental approach to economics is not new – Milton Friedman took it in his 1953 essay, “The Methodology of Positive Economics.” In this most cited economics paper, Friedman states that economists ought to produce theories that help us predict **and tautological classification schemes**. In contrast, I claim that economists ought to produce intellectual tools that help us predict and intellectual tools that help us explain causation. Intellectual tools that help us predict are useful in that they help us solve given problems. Intellectual tools that help us explain causation, such as Darwin’s theory of evolution and Wegener’s theory of plate tectonics, are useful in that they help us find better problems to solve. Wise decision-making requires performing both tasks well.

“A major problem with Friedman’s *Essays in Positive Economics* is that it has retarded the acceptance of theories that explain causation. The most prominent of these are evolutionary theories. In his intellectual autobiography, evolutionary economist F. A. Hayek wrote:

“[O]ne of the things I most regret is not having returned to a criticism of Keynes’s treatise, but it is as much true of not having criticized Milton Friedman’s [*Essays in*] *Positive Economics*, which in a way is quite as dangerous a book.”

“Friedman and his followers have created an intellectual vacuum. Foolish practitioners of neoclassical economics have rushed in to fill this vacuum. Worse, economic agents use neoclassical concepts without understanding their limitations as tools for finding problems to solve.”

was changed to:

“This instrumental approach to economics is not new – Milton Friedman took it in his 1953 essay, “The Methodology of Positive Economics.” In this most cited economics paper, Friedman states that economists ought to produce theories that help us predict. In contrast, I claim that economists ought to produce intellectual tools that help us predict and intellectual tools that help us explain causation.

“My perspective is thoroughly recursionist, by which I mean that it focuses on the process that we apply recursively in order to solve the infinitely large problem of how intelligent beings live good lives. This process is decision-making, defined as the process that begins with finding a problem to solve and ends in reviewing the implemented solution. From this decision-oriented perspective, the distinction between predictions and explanations of causation is crystal clear: predictions help us evaluate alternatives and explanations of causation help us formulate them. Intellectual tools that help us predict are useful in that they help us solve given problems. Intellectual tools that help us explain causation, such as Darwin’s theory of evolution

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and Wegener’s theory of plate tectonics, are useful in that they help us find better problems to solve. Wise decision-making requires performing both tasks well.”

### Preface, new sixteenth paragraph, last sentence

“Just as recognizing Adam Smith’s potential virtuous circle involving the division of labor and expansion of market size is key to understanding the dynamics of industrial age economies, recognizing the potential virtuous circle involving excellence in “consumption” and “productive activities” is key to understanding the dynamics of information age economies.”

was changed to:

“Just as recognizing Adam Smith’s potential virtuous circle involving the division of labor and expansion of market size is key to understanding the dynamics of industrial age economies, recognizing the potential virtuous circle involving excellence in “consumption” and “productive activities” is key to understanding the dynamics of information age economies: **Good people produce good products. Good products, particularly good intellectual tools, “produce” good people.**”

### Preface, new seventeenth paragraph, second sentence

“How can economists satisfy **customer** needs when economic agents themselves don’t know exactly what **these** needs are?”

was changed to:

“**In a freely evolving economy, economists’ customers are economic agents.** How can economists **help economic agents** satisfy **their** needs when economic agents themselves don’t know exactly what **their** needs are?”

### Preface, last paragraph

“**Human** cultures **evolve** most readily when individual **humans** decide wisely. Wise decision-making is as much a matter of choosing the best problem to solve (effectiveness) as it is of choosing the best alternative to a given problem (efficiency). We need theories that explain what happens in economies as well as those that predict what will happen in markets. Further, **human** cultures **evolve** most readily, and peaceably, when there is a free exchange of ideas about our ultimate ends and the best means to them. We need a common **classification system, a conceptual framework**, for thinking about our ultimate ends and the best means to them. A good economic strategy provides both theories that explain what happens in economies and a common conceptual framework for thinking about our ultimate ends and the best means to them.”

was changed to:

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“Cultures **progress** most readily when individuals decide wisely. Wise decision-making is as much a matter of choosing the best problem to solve (effectiveness) as it is of choosing the best alternative to a given problem (efficiency). We need theories that explain what happens in economies as well as those that predict what will happen in markets. Further, cultures **progress** most readily, and peaceably, when there is a free exchange of ideas about our ultimate ends and the best means to them. We need a common conceptual framework for thinking about our ultimate ends and the best means to them. A good economic strategy provides both theories that explain what happens in economies and a common conceptual framework for thinking about our ultimate ends and the best means to them. **In effect, it is a research program not only for economists but also for economic agents.**”

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## Changes in Version 2003.05.10

### Preface and Chapter 2

Eliminated all references to causation, e.g., changed “explanations of causation” to “explanations.” “Explanations of causation” has proved to be a trigger word for arguments that have nothing to do with the clear utilitarian distinction between predictions and explanations.

### Chapter 2, *Theories produce predictions and explanations.*, second paragraph

“Explanations are not simply predictions “written backwards.” In *deterministic chaotic systems*, **physicists** can explain without being able to predict equally well. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate.” Further, quantum mechanics provides very accurate statistical predictions of subatomic events without explaining their causes equally well. **Physicists currently seek better means of explaining, theories of what lies “beneath” or “behind” quantum mechanics, e.g., superstring theory, rather than better means of predicting what quantum mechanics predicts.**”

was replaced by the following footnote:

“Explanations are not simply predictions “written backwards.” **Some theories explain relatively better than they predict and others predict relatively better than they explain.** In *deterministic chaotic systems*, **we** can explain without being able to predict equally well. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits

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our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate.” Other theories predict relatively better than they explain: Quantum mechanics provides very accurate statistical predictions of subatomic events without explaining their causes equally well. **Rather than better means of predicting what quantum mechanics predicts, physicists currently seek to explain what links subatomic phenomena and cosmological phenomena. The best remind themselves “not to confuse the map with the territory.”**”

### Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph

Added the paragraph:

“Note that this Venn diagram is nothing more than a simple static representation of the complex dynamic process of refining useful knowledge. Copernicus’s explanation of the solar system began as a philosophical theory (3). It became a scientific explanation (4) by helping Kepler find an explanation that was able to predict the trajectories of planets better than other theories of its day. It became a former scientific explanation when Kepler’s theory displaced it as the best scientific explanation for all intents and purposes.”

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## Changes in Version 2003.05.24

### Preface, fifteenth paragraph

“Intellectual tools that **help us** predict and those that **help us** explain ought to have different foundations. To be effective, tools **that** help us predict must be based *on what people will do*. In contrast, tools **that** help us explain must be based *on what the wise would do*. Only a fool would choose a tool for finding problems to solve based on what the average person has chosen in the past.”

Added the sentence:

“Intellectual tools that predict and those that explain ought to have different foundations. To be effective, tools **for helping** us predict must be based *on what people will do*. In contrast, tools **for helping** us find problems to solve must be based *on what the wise would do*. Only a fool would choose a tool for finding problems to solve based on what the average person has chosen in the past. **Intellectual tools that explain ought to be based on enlightened self-interest, not revealed self-interest.**”

### Chapter 1, *The Recursionist Approach*, last paragraph, third sentence

Added the footnote:

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“We can see the importance of world-view / strategic vision in the Cold War rivalry beneath the seas. At the beginning of the nuclear submarine era, the Soviets assumed that NATO submarines had as difficult time detecting their submarines as they did detecting NATO ones. Given this belief, the Soviets viewed submarines as being like contemporary aircraft. Rather than focusing on stealth, they focused on speed and diving capability. In the mid-seventies the Soviets discovered how easily the US Navy tracked their submarines. This discovery led them to build a new fleet of much stealthier submarines, which greatly lowered the probability of a quick NATO victory at sea. The vision of stealthy submarines produced better problems to solve than the vision of fast, deep diving ones.”

### Chapter 3, Secular Humanist Ends, sixteenth paragraph, first three sentences

“Magical mysticism has advantages and disadvantages. Its **otherworldly** focus can help us cope with worldly stress and disappointments. In addition, it can help us improve the performance of a difficult activity by allowing us to detach ourselves from the activity and the results of that activity. **In addition**, it can help us improve the performance of a difficult activity by allowing us to detach ourselves from the activity and the results of that activity.”

was changed to:

“Schweitzer explains that humans have a need for mystical oneness — a religious impulse — that we can satisfy by relinking to the infinite Being by either renouncing or embracing the world and life. This explanation is logical in that it follows the rules for philosophical theories. However, it is aesthetically flawed in that it presumes the existence of the infinite Being when this metaphysical assumption is not necessary to explain what it explains. This violates the philosophical standard of beauty known as Occam’s Razor. We can easily correct this flaw by eliminating this assumption. The corrected explanation is that humans have a need for mystical oneness that we satisfy either by embracing the world and life or by embracing the complete absence of the world and life (oblivion).

“The corrected explanation is good philosophy. For it to be good science, it must stand ready to be proven less useful than competing explanations in helping us find better problems to solve.

“Exploring the relative merits of magical and ethical mysticism yields several useful **problems**. Magical mysticism has advantages and disadvantages. Its **unworldly** focus can help us cope with worldly stress and disappointments. **Further**, it can help us improve the performance of a difficult activity by allowing us to detach ourselves from the activity and the results of that activity.”

### Chapter 3, Secular Humanist Ends, new nineteenth paragraph, second sentence

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“Because it **concerns only our relationship with the infinite Being and not** our relationship with **life**, it offers no foundation for an ethical system.”

was changed to:

“Because it **ignores** our relationship with **the world**, it offers no foundation for an ethical system.”

### **Chapter 3, Secular Humanist Ends, second to last paragraph, second sentence**

“He failed to recognize that we can combine the best of magical and ethical mysticism by setting our objectives according to ethical mysticism, **but** acting according to magical mysticism.”

was changed to:

“He failed to recognize that we can combine the best of magical and ethical mysticism by setting our objectives according to ethical mysticism **and then** acting according to magical mysticism.”

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## **Changes in Version 2003.05.27**

### **Preface, sixteenth paragraph**

Inserted the paragraph:

“At issue is not whether the development of consumer preferences can be predicted but rather whether it can be explained. I argue that consumer preferences emerge from the complex interaction of two types of pleasure. The first is the reward for satisfying our teleonomic programming (pleasure-in-being) and the second is the reward for acting (pleasure-in-acting). In Western ethics, we see these two types of pleasure in Spinoza’s definition of pleasure as the result of moving toward completion (pleasure-in-being) and Aristotle’s definition of pleasure as the result of becoming lost in activity (pleasure-in-acting). In Eastern ethics, we see the complex interaction of these two types of pleasure in the Hindu doctrine of the three gunas and in the Taoist doctrine of yin and yang. In these and many other ethical traditions, enlightened self-interest is a matter of finding pleasure-in-acting in those activities that yield pleasure-in-being.”

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## **Changes in Version 2003.06.10**

### **Preface, fifteenth paragraph, last two sentences**

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“Only a fool would choose a tool for finding problems to solve based on what the average person has chosen in the past. Intellectual tools that explain ought to be based on *enlightened* self-interest, not *revealed* self-interest.”

was changed to:

“The wise choose based on what they need to learn in order to achieve their ultimate ends ever more efficiently. They look beyond what they currently know. Thus, intellectual tools that explain ought to be based on *enlightened* self-interest, not *revealed* self-interest.”

### Chapter 2, The Nature of Theories, first paragraph, second sentence

Changed “chapter” to “book.”

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## Changes in Version 2003.06.30

### Acknowledgments, first paragraph, last sentence

“Fred was extremely generous with his time **when I needed it most.**”

was changed to:

“Fred was extremely generous with his time.”

### Acknowledgments, third paragraph, last sentence

“In 1996, he suggested that I stop trying to convert economists and write a book for the **general public “from the heart.”**”

was changed to:

“In 1996, he suggested that I stop trying to convert economists and write a book for the **Harvard Business Review / Economist audience.**”

### Acknowledgments, third to the last paragraph

“The fifth is the speaker at the Stanford Graduate School of Business orientation meeting who told our incoming class (1979) that if we learned nothing else in the next two years, we should learn the difference between efficiency and effectiveness. I may not have remembered his name, but I remembered his advice.”

was changed to:

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“The fifth is James Likens, the current head of the Pomona College economics department. In the early seventies, the department was dominated by Keynesians of the Hick’s ISLM persuasion. After experiencing stagflation and hearing few objections to Nixon’s wage and price controls, which came very close to bankrupting my father’s manufacturing company, I vowed to stay as far away from Keynesian macroeconomics as possible. This meant taking every economics course taught by Jim, who I found to be the most inquisitive professor in the department. He frequently told us that social scientists can tell many stories about this or that complex phenomenon and that economists don’t do dynamics well. A poster in my high school physics classroom proclaimed: “*The problem, once solved, is simple.*” To this I add: “*The problem, once found, is obvious.*””

### Acknowledgments, last paragraph

“Students of F. A. Hayek will recognize the homage I paid him in the dedication. Although I finished my first draft before reading any of his works, I owe more to Hayek than to any other economist. **In the Afterword of *The Constitution of Liberty*, this self-proclaimed member of the party of life explained why he was neither a conservative nor a libertarian. Understanding this essay helped me understand the dynamic balance of progress and freedom that made America great. In the Afterword of this book, I explain why I am a classical liberal progressive, by which I mean someone who advocates classical liberal means and ever more inclusive ends.**”

was changed to:

“Students of F. A. Hayek will recognize the homage I paid him in the dedication. Although I finished my first draft before reading any of his works, I owe more to him than to any other economist. **Understanding his popular works helped me better understand the dynamic balance of freedom and ever expanding concept of justice that made the United States both great and the Great Satan: liberal progressive societies tend to destroy inefficient and ineffective traditions.**

“Hayek exposed the practical problems of central planning. His goal was to demonstrate why socialism is fatally flawed. In contrast, I expose practical problems of capitalism, the free enterprise system as it is currently understood. My goal is to improve the free enterprise system by improving our understanding of our ultimate ends and the best means to them.”

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### Changes in Version 2003.07.25

#### Preface

Replaced the old preface with a new one that targets business school students.



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## Acknowledgments, second to last paragraph, last sentence

Changed “liberal progressive **societies** tend to **destroy inefficient and ineffective traditions**” to “**classical** liberal progressive **cultures** tend to **abandon their less wise traditions.**”

## Acknowledgments, last paragraph, last sentence

Changed “our ultimate ends and the best means to them” to “enlightened self-interest.”

## Chapter 1, Overview, first paragraph, second sentence

“*A New Foundation* discusses the philosophical foundation.”

was changed to:

“*New Foundations* proposes new foundations for science and evolutionary explanations.”

## Chapter 1, Overview, first paragraph, sixth sentence

“The final two chapters discuss **what modern economists call** macroeconomic issues.”

was changed to:

“The final two chapters discuss macroeconomic issues.”

## Chapter 2, title

The title was changed from: “A New Foundation” to “New Foundations.”

## Chapter 2, The Nature of Theories, title

The title was changed to “Refining Everyday Thinking.”

## Chapter 2, The Nature of Theories, last three sentences

“This book proposes a similar strategy for learning how to live ever more wisely. **It** involves slowly tightening a loose theory of means by removing ignorance in the form of theories of ultimate ends. Understanding this strategy requires understanding something about theories.”

was changed to:

“This book proposes a similar strategy for learning how to live ever more wisely, **which** involves slowly tightening a loose theory of means by removing ignorance in the

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form of theories of ultimate ends. Understanding this strategy requires understanding something about **the nature of** theories.”

### **Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph**

“Note that this Venn diagram is nothing more than a simple static representation of the complex dynamic process of refining useful knowledge. Copernicus’s explanation of the solar system began as a philosophical theory (3). It became a scientific explanation (4) by helping Kepler find an explanation that was able to predict the trajectories of planets better than other theories of its day. It became a former scientific explanation when Kepler’s theory displaced it as the best scientific explanation for all intents and purposes.”

was changed to:

“Thus, we should judge neoclassical economics, which aims at helping us predict what happens in markets, by how well it helps us to predict what happens in markets. Neoclassical economics should stand ready to be proved less useful in helping us predict what happens in markets than competing theories. In contrast, we should judge evolutionary economic theories, which aim at helping us explain what happens in economies, by how well they help us formulate alternatives. These explanations should stand ready to be proved less useful in helping us formulate alternatives than competing explanations.”

### **Chapter 2, A New Foundation for Explanation, title**

The title was changed to “Refining Evolutionary Explanations”

### **Chapter 2, Refining Evolutionary Explanations, first paragraph, last sentence**

“The economics profession fails to provide such theories.”

was changed to:

“The only school of economics that comes close to producing such theories is the Austrian school.”

### **Chapter 2, Refining Evolutionary Explanations, second paragraph**

“The major reason the economics profession has failed to provide such theories is that most schools of economics claim that the primary purpose of economic theories is to predict, not explain. The notable exception is one small but increasingly influential school, the Austrian school of evolutionary economics.”

was deleted.

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### Chapter 2, Refining Evolutionary Explanations, last paragraph, last sentence

“Doing so leads to happiness, a life well-lived.”

was changed to:

“Following our internal programming leads to happiness, a life well-lived.”

### Chapter 2, Summary, entire section

“This chapter proposed an evolutionary foundation for evolutionary economic explanations. These explanations should stand ready to be proved less useful than competing explanations in helping us find better problems to solve.”

was deleted.

### Chapter 4, *Pleasure and Pain*, second paragraph, last sentence

“We can think of the first, pleasure-in-acting, as “pleasure” and the second, pleasure-in-being, as “joy.””

was changed to:

“We can think of the first as pleasure-in-acting and the second as pleasure-in-being.”

### Chapter 4, *Pleasure and Pain*, third paragraph

“In Western ethics, Aristotle best defines ‘pleasure’ and Spinoza best defines ‘joy.’ Aristotle defined ‘pleasure’ as the thing that perfects or completes activity. Pleasure comes from being absorbed in activity. To give us pleasure, an activity must not be so easy as to be boring, nor so difficult as to be overwhelming. Work that does not challenge us is boring and work that challenges us too much is overwhelming. Between these two extremes there is a level of challenge that enables us to become absorbed in work. Complete pleasure, total involvement in activity, is ecstasy. Pain (in acting) is anything that interferes with losing ourselves in activity.”

was changed to:

“In Western ethics, Aristotle best defines pleasure-in-acting and Spinoza best defines pleasure-in-being. Aristotle defined pleasure-in-acting as the thing that perfects or completes activity. Pleasure-in-acting comes from being absorbed in activity. To give us pleasure, an activity must not be so easy as to be boring, nor so difficult as to be overwhelming. Work that does not challenge us is boring and work that challenges us too much is overwhelming. Between these two extremes there is a level of challenge that enables us to become absorbed in work. Complete pleasure-in-acting, total

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involvement in activity, is ecstasy. Pain-in-acting is anything that interferes with losing ourselves in activity.”

### Chapter 4, *Pleasure and Pain*, all but last paragraph

Replaced “pleasure” with “pleasure-in-acting” and “joy” with “pleasure-in-being.”

### Chapter 4, *Pleasure and Pain*, last paragraph

“Because pleasure and joy can each increase the other, there exists a potential virtuous circle of pleasure and joy. Learning to find pleasure in what is good for us encourages us to do what is good, which in turn gives us the potential to do more. Pursuing this virtuous circle increases not only our pleasure and joy but also our abilities, knowledge, material goods, and habit of pursuing the good. Misfortune, ignorance, material scarcity, and incontinence tend to break this circle. We need practical wisdom, knowledge of how to act wisely, to pursue this virtuous circle.”

was changed to:

“Thus, there exists a potential virtuous circle of pleasure-in-acting (“pleasure”) and pleasure-in-being (“joy”): learning to find pleasure in activities that are good for us encourages us to do these activities, which in turn gives us the potential to do more. Pursuing this virtuous circle increases not only both “pleasure” and “joy” but also our abilities, knowledge, material goods, and habit of pursuing the good. Misfortune, ignorance, material scarcity, and incontinence tend to break this circle.”

### Chapter 4, *Alternatives to Pursuing Happiness*, last paragraph

“We can also see this distinction in Taoism. Here, yin corresponds to dark inertia (pleasure-in-being); yang corresponds to passion (pleasure-in-acting); and the balance of yin and yang corresponds to lucidity (pursuing the virtuous circle of pleasure and joy).”

was changed to:

“We can also see this distinction in Taoism. Here, yin corresponds to dark inertia (pleasure-in-being / joy); yang corresponds to passion (pleasure-in-acting / pleasure); and the balance of yin and yang corresponds to lucidity (pursuing the virtuous circle of pleasure and joy).”

### Chapter 5, Introduction, third paragraph, second sentence

“From the recursionist perspective, the problem is obvious: economists address strategic issues using the tactical conceptual framework of marginalist economics.”

was changed to:

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“From the recursionist perspective, the problem is obvious: addressing strategic issues using the **inherently** tactical conceptual framework of marginalist economics **is foolish.**”

### Appendix, Folding in Production Operations, last paragraph, last sentence

“**Taking this argument to its logical limit**, a traditional job shop is simply countless continuous process manufacturing lines folded in **to a small space.**”

was changed to:

“**From this perspective**, a traditional job shop is simply countless continuous process manufacturing lines folded **together poorly.**”

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## Changes in Version 2003.08.02

### Preface, eighth paragraph, last two sentences

“For Friedman, this alternative means is Adam Smith’s vision of economies as complex adaptive systems that arise out of the decision-making of individual economic agents. Friedman’s popular works, e.g., *Free to Choose*, focus on decision-making, not on allocating scarce resources.”

was changed to:

“From his popular works and public lectures, we know that Friedman thinks about economies as complex adaptive systems that emerge from the decision-making of individual economic agents. He focuses on decision-making, not on allocating scarce resources.”

### Preface, twelfth paragraph, second and third sentences

“To be most effective in helping us formulate alternatives, theories that explain causation must be based on what we would do if we had complete knowledge. **This requires that we know what we do not know.**”

was was changed to:

“To be most effective in helping us formulate alternatives, theories that explain causation must be based on what we would do if we had complete knowledge **of what we ought to seek.**”

### Preface, last paragraph, first two sentences

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“Why ought we to step backwards from Neoclassical self-interest to Classical *enlightened* self-interest at the dawn of the information age? Just as industrial economies are driven by a virtuous circle that involves the division of labor and the expansion of market size, information age economies are driven by a virtuous circle that involves excellence in trade and production and excellence in consumption.”

was changed to:

“At the dawn of the industrial age, Adam Smith’s example of a pin factory demonstrated the wisdom of pursuing the virtuous circle of the division of labor and the expansion of market size. Today, the example of the Toyota production system demonstrates the wisdom of pursuing the virtuous circle of increasing excellence in production and trade and increasing excellence in consumption.”

### Preface, last paragraph, last two sentences

“We **ought** to know more about what makes people good. We **ought to know** more about what enlightened self-interest truly is.”

was changed to:

“**Given this new reality, we owe it to ourselves** to know more about what makes people good. We **owe it to ourselves to learn** more about what enlightened self-interest truly is.”

### Chapter 3, footnote 11

“This argument does not try to refute metaphysical assumptions, **especially assumptions about** the ultimate end of existence.”

was changed to:

“This argument does not try to refute metaphysical assumptions, **particularly those concerning** the ultimate end of existence.”

### Chapter 4, Introduction

“**The recursionist core theory of means is both simple and straightforward:** Excellence is the wise use of resources in satisfying our needs. We increase excellence by choosing better subordinate ends and better means to **given** subordinate ends.

“Some concepts derived from marginalist economics tend to blind us to better subordinate ends. This chapter proposes recursionist alternatives to four of these concepts: consumption, trade, production, and profit.”

was changed to:

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“Excellence **in means** is the wise use of resources in satisfying our needs. We increase excellence by choosing better subordinate ends and better means to **chosen** subordinate ends. Some concepts derived from marginalist economics tend to blind us to better subordinate ends. This chapter proposes **recursionist** alternatives to four of these concepts: consumption, trade, production, and profit.”

### **Chapter 6, footnote 4, last sentence, last phrase**

Changed “but vision (and related concepts)” to “but rather vision (and related concepts).”

### **Chapter 6, Fluid Relationships, last sentence**

“In the long run, fluid relationships promote lucidity by **allowing** practical wisdom to **flourish**.”

was changed to:

“In the long run, fluid relationships promote lucidity by **encouraging the spread of** practical wisdom.”

### **Appendix, fifth footnote, last sentence**

“This conceptual model is founded on the assumption that people do not learn through experience.”

was deleted.

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## **Changes in Version 2003.08.07**

### **Preface, first paragraph, first sentence**

Changed “ethics” to “normative economics.”

### **Preface, third paragraph, last sentence**

“Thus, there can be no complete theory to guide our actions.”

was changed to:

“We can never be certain about what it is that we ought to seek.”

### **Preface, eleventh paragraph, last sentence**

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“The Austrians failed to rise to Friedman’s challenge.”

was changed to:

“Friedman’s solution divided economics into theories that help us predict and normative theories, theories that help us formulate alternatives. The Austrians failed to rise to Friedman’s challenge by abandoning the former in order to focus exclusively on the latter. They failed to rededicate themselves to explaining causation.”

### Preface, fourteenth and fifteenth paragraphs

“Fortunately, the solution is also both simple and straightforward: How can we know what we do not know? We can learn by doing. Rather than trying to find the best theory of what we ought to seek, we can create strategies for **eliminating inferior theories** of what we ought to seek. **The goal is to create an explicitly moral free enterprise system, one that not only encourages the creation of knowledge of how to produce and trade ever more wisely but also encourages the creation of knowledge of how to turn consumer goods into good lives ever more wisely.**

“This radical solution will be resisted by those intellectuals who define the markets for intellectual tools to exclude everything but theories. To such people, it takes a theory to beat a theory. They ought to think carefully about who ultimately defines the market for intellectual tools. In the market for intellectual production tools, *the consumers of intellectual tools* decided that Toyota’s early information age production strategy was better than late industrial age production theories. The strategy beat the theories.”

was changed to:

“Fortunately, the solution is also both simple and straightforward: How can we know what we do not know? We can learn by doing.

“A strategy is a general plan for solving a problem that is too large or too complex for a specific solution. Rather than trying to find the best theory of what we ought to seek, we can create a strategy for **learning** what we ought to seek.

“This radical solution will be resisted by those intellectual tool makers who define the markets for intellectual tools to exclude everything but theories. To such people, it takes a theory to beat a theory. **They ought to consider the following argument:**

**“A complete conceptual system for helping us formulate alternatives must include all uncertainty. No theory can encompass the uncertainty of all of its own fundamental propositions. Addressing all uncertainties associated with any given theory requires introducing a more complete theory. Thus, a complete conceptual system for helping us formulate alternatives must be based not on a theory but rather on a strategy for solving an open-ended problem that includes all uncertainty.**



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“These **intellectual tool makers** also ought to think carefully about who ultimately defines the market for intellectual tools. In the market for intellectual production tools, *the consumers of intellectual tools* decided that Toyota’s early information age production strategy was better than late industrial age production theories. The strategy beat the theories.”

### **Preface, last paragraph, second sentence**

“Today, the **example of** the Toyota...”

was changed to:

“Today, the Toyota...”

### **Acknowledgments, second to last paragraph, last sentence**

“Understanding his popular works helped me better understand the dynamic balance of **freedom and an ever expanding concept of justice that** made the United States both great and the Great Satan: classical liberal progressive cultures tend to abandon their less wise traditions.”

was changed to:

“Understanding his popular works helped me better understand the dynamic balance of **an ever expanding concept of justice and freedom. This dynamic balance is what** made the United States both great and the Great Satan: classical liberal progressive cultures tend to abandon their less wise traditions.”

### **Chapter 2, Refining Evolutionary Explanations, fifth paragraph, last sentence**

“Therefore, we can safely assume that our basic genetic programming is fixed.<sup>5</sup>”

was changed to:

“Although we can improve the process by which our genetic programming develops into our higher level programming, we cannot improve our higher level internal programming beyond the bounds set by our genetic programming.<sup>5</sup> Therefore, we can safely assume that our fully realized internal programming is fixed.”

### **Chapter 2, fifth footnote, second sentence**

Changed “internal programming” to “genetic programming.”

### **Chapter 2, Refining Evolutionary Explanations, sixth paragraph, first sentence**

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“Although we can safely assume that **we have fixed internal programming**, we do not know, and may never know completely, what this internal programming is.”

was changed to:

“Although we can safely assume that **our fully realized internal programming is fixed**, we do not know, and may never know completely, what this internal programming is.”

### Chapter 2, Refining Evolutionary Explanations, last paragraph

“Explanations based on **the set of all acceptable** teleonomic theories are unique in that they both describe *what is* and prescribe *what ought to be*. **Specifically, they both describe the program that motivates us and prescribe that we owe it to ourselves (ought) to follow our programming. Following our internal programming leads to happiness, a life well-lived.**”

was changed to:

“Explanations based on teleonomic theories are unique in that they both describe *what is* and prescribe *what ought to be*. **These explanations describe our internal programming. Following our internal programming leads to happiness, a life well-lived. Because we owe it to ourselves (ought) to follow our internal programming, these explanations also prescribe what we ought to do.**”

### Chapter 3, Eliminating Simplistic Theories, first paragraph, first sentence

“Our needs are complex in that they at more than one level of abstraction.”

was changed to:

“Our needs are complex in that they **emerge** at more than one level of abstraction.”

### Chapter 3, Eliminating Simplistic Theories, fifth paragraph, last sentence

Changed “many people” to “most people.”

### Chapter 3, Eliminating Simplistic Theories, tenth paragraph, first sentence

Changed “theory” to “doctrine.”

### Chapter 4, Consumption, first paragraph, first three sentences

“The marginalist concept of consumption is loosely based on **Jeremy Bentham’s** utilitarian ethics. In contrast, the recursionist concept is based on **a loose amalgam of** humanistic ethical theories. Humanistic ethics differs markedly from **utilitarianism.**”

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was changed to:

“The marginalist concept of consumption is loosely based on utilitarian ethics. In contrast, the recursionist concept is based on humanistic ethical theories. Humanistic ethics differs markedly from **utilitarian ethics**.”

### Chapter 4, Consumption, first paragraph, first three sentences

“Deriving pleasure from an activity requires the physical and mental ability to perform that activity, the knowledge of how to perform it, sufficient time to perform it, and any necessary material goods.”

was changed to:

“Deriving pleasure from an activity requires the physical capacity, mental capacity, spiritual capacity, time, material goods, and knowledge necessary to perform it.”

### Chapter 4, Pleasure and Pain, fifth paragraph

“Deriving pleasure from an activity requires the **physical and mental ability to perform that activity, the knowledge of how to perform it, sufficient time to perform it, and any necessary material goods**. Common pleasures come from activities that require common **capacities, knowledge, and material goods**. Watching a beautiful sunset is a common pleasure. Deriving pleasure from other activities can require making an investment in training, **learning, or material goods**. Finding pleasure in playing chess requires knowing how to play the game.”

was changed to:

“Deriving pleasure from an activity requires **the physical capability, mental capability, spiritual capability, time, material goods, and knowledge of how to perform it**. Common pleasures come from activities that require common **capabilities, material goods, and knowledge**. Watching a beautiful sunset is a common pleasure. Deriving pleasure from other activities can require making an investment in training, **material goods, or learning**. Finding pleasure in playing chess requires investing in how to play the game.”

### Chapter 4, Pleasure and Pain, fifth paragraph, last two sentences

“Pursuing this virtuous circle increases not only **both** “pleasure” and “joy” but also our abilities, knowledge, non-knowledge goods, **and habit of pursuing the good**. Misfortune, ignorance, material scarcity, **and incontinence** tend to break this circle.”

was changed to:

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“Pursuing this virtuous circle increases not only pleasure and joy but also our abilities, knowledge, and non-knowledge goods. Misfortune, ignorance, and material scarcity tend to break this circle.”

### **Chapter 4, Practical Wisdom, second paragraph, last two sentences**

“Unlike most other forms, using it enhances it. By acting wisely we develop and reinforce the habit of acting wisely.”

was changed to

“Like most other forms of human knowledge, using it enhances it. We develop and reinforce the habit of acting wisely by acting wisely.”

### **Chapter 4, Human Capital, Work, and Leisure, last paragraph, last sentence**

“Too often ignored, such actions by employees, managers, and chief executives are good business practice.”

was deleted.

### **Chapter 4, Three Common Misconceptions, title**

Changed “misconceptions” to “misbeliefs.”

### **Chapter 4, Three Common Misbeliefs, first paragraph, first three sentences**

“Several misconceptions hinder our ability to increase excellence in trade. The most important of these is not recognizing the possibility of improving the means of trade, which is common among those with a marginalist world-view. Even those who recognize the possibility often dismiss it as impractical or inappropriate to their situation.”

was changed to:

“Several common beliefs hinder increasing excellence in trade. The most important of these is the belief that the means of trade cannot be improved.”

### **Chapter 4, Three Common Misbeliefs, first paragraph, last sentence**

“Early American failures to adopt it warn us that this impressive means of inducing knowledge requires recognizing the possibility of improving the means of trade.”

was deleted.

### **Chapter 4, Three Common Misbeliefs, second paragraph, first sentence**

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“A second common belief that **keeps us from improving the** excellence in trade...”

was changed to:

“A second common belief that **hinders increasing** excellence in trade..”

### **Chapter 4, Three Common Misbeliefs, sixth paragraph, first sentence**

“A third common belief that **prevents us from improving** trade is the belief that the only information that we need to make **rational** purchasing decisions is the knowledge of the good’s quality and price.”

was changed to:

“A third common belief that **hinders increasing excellence in** trade is the belief that the only information that we need to make **wise** purchasing decisions is the knowledge of the good’s quality and price.”

### **Chapter 4, Three Common Misbeliefs, sixth paragraph, last three sentences**

“Knowing that what we consume was produced ethically helps us to satisfy this need. However, providing information about the means of production is not always wise. It is only wise when the benefits of providing this information exceed the costs of providing it. Until people feel the need for it, providing it is wasteful.”

were deleted.

### **Chapter 4, Production, first sentence**

Changed “can produce” to “produces.”

### **Chapter 7, second paragraph, second sentence**

“Where current microeconomic theories help us **use scarce resources to achieve our subordinate ends**, recursionist explanations help us **choose these ends**.”

was changed to:

“Where current microeconomic theories help **evaluate alternatives**, recursionist explanations help us **formulate them**.”

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## **Changes in Version 2003.08.26**

### **Chapter 2, footnote 1**

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Change Archive for 1998 – 2003

“<sup>1</sup> Explanations are not simply predictions ‘written backwards.’ Some theories explain relatively better than they predict and others predict relatively better than they explain. In *deterministic chaotic systems*, we can explain without being able to predict equally well. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the ‘weather.’ In the long term, the best we can hope to do is to predict the bounds of the trajectory, the ‘climate.’ Other theories predict relatively better than they explain: Quantum mechanics provides very accurate statistical predictions of subatomic events without explaining their causes equally well. Rather than better means of predicting what quantum mechanics predicts, physicists currently seek to explain what links subatomic phenomena and cosmological phenomena. The best remind themselves ‘not to confuse the map with the territory.’”

was changed to:

“<sup>1</sup> Explanations are not simply predictions ‘written backwards.’ Some theories explain relatively better than they predict and others predict relatively better than they explain. In *deterministic chaotic systems*, we can explain without being able to predict equally well. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the ‘weather.’ In the long term, the best we can hope to do is to predict the bounds of the trajectory, the ‘climate,’ **which ‘emerges’ from the complex interactions of matter and energy.**”

“Other theories predict relatively better than they explain: Quantum mechanics provides very accurate statistical predictions of subatomic events without explaining their causes equally well. Rather than better means of predicting what quantum mechanics predicts, physicists currently seek to explain what links subatomic phenomena and cosmological phenomena. The best remind themselves ‘not to confuse the map with the territory.’”

### Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph, end

Added the footnote:

“<sup>3</sup> This instrumentalist concept of science addresses a common argument against Milton Friedman’s more limited instrumentalist concept, which is that Friedman’s concept would have rejected Copernicus’s theory of the solar system on the grounds that it did not predict as well as some contemporary Ptolemaic theories. Under this concept of science, Copernicus’s theory would have been rejected as a theory that predicts but not as theory that explains. Copernicus’s theory proved its worth as a theory that explains when it helped Kepler find a theory that predicted better than any Ptolemaic theory.”

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## Chapter 3, ninth footnote

“<sup>9</sup> Anything less than complete ignorance will introduce bias. For example, if we simply imagine that we were born into our current society, we will tend to ignore the potential affect of our behavior on members of other human societies, future generations of humans, and non-human life. Using Rawls’s means, we can argue that incomplete forms of ethical mysticism permit unjust predation and exploitation. We also can argue that they permit unjust limitations on cooperation. The most obvious examples are restrictions on “foreign” trade. These limit cooperation with living members of other societies. Less obvious are actions that effectively limit cooperation with future generations. Justice requires a recursive agreement between generations similar in form and spirit to the Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants. Each generation must seek to maximize the amount of progress for the turbulence it can bear. **Each generation must ask itself, ‘If not now, when? If not us, who?’** Shielding a favored group from change violates this agreement. “Social justice” is not the highest form of justice. Whenever we are tempted to use ‘social justice’ we **should consider substituting either ‘tribal justice’ or ‘justice’ depending on what we mean to say.**”

was changed to:

“<sup>9</sup> Anything less than complete ignorance will introduce bias. For example, if we simply imagine that we were born into our current society, we will tend to ignore the potential affect of our behavior on members of other human societies, future generations of humans, and non-human life. Using Rawls’s means, we can argue that incomplete forms of ethical mysticism permit unjust predation and exploitation. We also can argue that they permit unjust limitations on cooperation. The most obvious examples are restrictions on “foreign” trade. These limit cooperation with living members of other societies. Less obvious are actions that effectively limit cooperation with future generations **of intelligent life.**

Justice requires a recursive agreement between generations similar in form and spirit to the Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants. Each generation must seek to maximize the amount of progress for the turbulence it can bear. Shielding a favored group from change violates this agreement. **The basis of this complete concept of justice is not a social contract but rather a contract between all intelligent life for the benefit of all life. For those who believe that all life contains an element of the infinite Being, it is a contract with the infinite Being.**

“Whenever we are tempted to use ‘social justice’ we **ought to substitute ‘tribal justice’ in order to remind ourselves and others that we are talking about an inherently incomplete concept of justice.**”

## Chapter 6, *Consider Incentives and Enforcement Costs*, second and third paragraphs, including footnote

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“From a **dynamic** perspective, the cost of enforcing laws is much more problematic. Assume behavior “A” is helpful in pursuing happiness and that if we perform “A,” we will eventually learn that “A” is helpful. A government can prescribe “A” or let us learn that “A” is helpful. In theory, if the total cost of prescribing “A” is greater than the total cost of not prescribing “A,” then prescribing “A” is unjust. Further assume that behavior B is harmful and that if we perform “B,” we will eventually learn that “B” is harmful. A government can proscribe “B” or let us learn that “B” is harmful. In theory, if the total cost of proscribing “B” is greater than the total cost of not proscribing “B,” then proscribing “B” is unjust. What matters is the justice of interventions, not behaviors.

“Many factors make judging the interventions of governments difficult: We do not always learn from our experiences. We learn from others’ experiences as well as from our own. Behaviors often help or harm others more directly than us. We have different belief systems, often based on different concepts. Public officials have private and bureaucratic agendas. We do not understand fully how all of these complicating factors interact.<sup>1</sup>

“<sup>1</sup> Regrettably, we currently have no theory that captures enough of reality to provide us with cookbook judgments about government intervention. *Public choice economics* provides insights into the dynamics of how governments actually work and the field of *law and economics* provides insights into the cost of enforcing laws. The emerging science of complex dynamic systems may eventually provide us with the transaction cost theory that Ronald Coase called for in his Nobel lecture. Until computer simulation provides us with such a tool, judging government interventions will remain more art than engineering.”

was changed to:

“From the **recursionist** perspective outlined in this work, justice requires that we **continuously learn how better to pursue happiness**. From this perspective, the cost of enforcing laws is much more problematic. Assume behavior “A” is helpful in pursuing happiness and that if we perform “A,” we will eventually learn that “A” is helpful. A government can prescribe “A” or let us learn that “A” is helpful. In theory, if the total cost of prescribing “A” is greater than the total cost of not prescribing “A,” then prescribing “A” is unjust. Further assume that behavior B is harmful and that if we perform “B,” we will eventually learn that “B” is harmful. A government can proscribe “B” or let us learn that “B” is harmful. In theory, if the total cost of proscribing “B” is greater than the total cost of not proscribing “B,” then proscribing “B” is unjust. What matters is the justice of interventions, not behaviors.”

### Appendix, second to the last paragraph, first sentence

“Recognizing this dynamic exposes problems on both sides.”

was changed to:



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“Recognizing this dynamic exposes problems on both sides of the current political divide.”

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## Changes in Version 2003.08.27

### Preface, second paragraph, second sentence

Deleted “(1949-59).”

### Preface, fifth and sixth paragraphs

“In information age economies, this theoretical problem is very real. Arguably, the defining characteristic of information age economies is learning by doing. Our industrial age concept of excellence in means, efficiency, defines excellence to be a matter of using the least valuable scarce resources to achieve a given end. This concept of excellence is incompatible with learning by doing.

“The problem is that we can never be sure that the most efficient means to a given end that involves learning knowledge “X” is better than a less efficient means to the same end that involves learning knowledge “Y.” To be sure, we need to assign a value to knowledge “X” and “Y.” The inexhaustibility of knowledge — the fact that using knowledge does not deplete it — makes this impossible to do except in the very special case where we know exactly when and under what circumstances knowledge “X” and “Y” will be used in the future. Toyota used this insight about learning by doing to surpass the big three American motor vehicle manufacturing companies, who until recently focused on efficiency rather than on learning by doing.”

was changed to:

“The possibility of learning by doing makes this theoretical problem a very practical one. Our industrial age concept of excellence in means, efficiency, defines excellence to be a matter of using the least valuable scarce resources to achieve a given end. We can never be sure that the most efficient means to a given end that involves learning knowledge “X” is better than a less efficient means to the same end that involves learning knowledge “Y.” To be sure, we need to assign a value to knowledge “X” and “Y.” The inexhaustibility of knowledge — the fact that using knowledge does not deplete it — makes this impossible to do except in the very special case where we know exactly when and under what circumstances knowledge “X” and “Y” will be used in the future. We cannot know this without knowing exactly what it is that we ought to seek.”

### Preface, new ninth paragraph, third sentence

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“ By focusing the efforts of **the** most **talented** economists on the former, **Friedman and his followers have** retarded the development of the latter, particularly the development of Austrian economics, **the leading school of evolutionary economics.**”

was changed to:

“ By focusing the efforts of most economists on the former, **his solution has** retarded the development of the latter, particularly the development of Austrian economics.”

### Preface, third to last paragraph, argument, second and third sentences

“A complete conceptual system for helping us formulate alternatives must **include** all uncertainty. **No** theory can **encompass** the uncertainty of all of its own fundamental propositions. **Addressing** all uncertainties associated with any given theory requires introducing a more complete theory. Thus, a complete conceptual system for helping us formulate alternatives must be based not on a theory but rather on a strategy for solving an open-ended problem that includes all uncertainty.”

was changed to:

“A complete conceptual system for helping us formulate alternatives must **address** all uncertainty. **Because** no theory can **address** the uncertainty of all of its own fundamental propositions, **addressing** all uncertainties associated with any given theory requires introducing a more complete theory. Thus, a complete conceptual system for helping us formulate alternatives must be based not on a theory but rather on a strategy for solving an open-ended problem that **addresses** all uncertainty.”

### Preface, second to last paragraph

“These intellectual tool makers also ought to think carefully about who ultimately defines the market for intellectual tools. In the market for intellectual production tools, *the consumers of intellectual tools* decided that Toyota’s **early information age** production strategy was better than late industrial age production theories. The strategy beat the theories.”

was changed to:

“These intellectual tool makers also ought to think carefully about who **it is that** ultimately defines the market for intellectual tools. In the market for intellectual production tools, *the consumers of intellectual tools* decided that Toyota’s **learning by doing** production strategy was better than production theories **that focused on allocating scarce resources efficiently**. The strategy beat the theories.”

### Acknowledgments, second to last paragraph, third sentence

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“Understanding his popular works helped me better understand the dynamic balance of **an ever expanding concept of justice and freedom.**”

was changed to:

“Understanding his popular works helped me better understand the dynamic balance of **freedom and progress.**”

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### Changes in Version 2003.08.29

#### Chapter 1, Modern Economics' Blind Spot, last paragraph, last sentence

Changed “Toyota manufacturing system” to “Toyota production system.”

#### Chapter 1, Overview, fifth sentence

“*Increasing Excellence in Means* offers recursionist alternatives for several potentially misleading marginalist concepts.”

was changed to:

“*Increasing Excellence in Means* offers recursionist alternatives for several potentially misleading marginalist concepts **and apparent precepts.**”

#### Chapter 2, Predictions and Explanations, second paragraph

“Predictions help us **evaluate** uncertain events, which helps us evaluate alternatives. In contrast, explanations help us find better problems to solve.”

was changed to:

“Predictions help us **assign probabilities to** uncertain events, which helps us evaluate alternatives. In contrast, explanations help us find better problems to solve.”

#### Chapter 2, Refining Evolutionary Explanations, last paragraph

“Explanations based on teleonomic theories are unique in that they both **describe** *what is* and **prescribe** *what ought to be*. These explanations describe our internal programming. Following our internal programming leads to happiness, a life well-lived. Because we owe it to ourselves (ought) to **follow our internal programming**, these explanations also prescribe what we ought to **do.**”

was changed to:

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“Explanations based on teleonomic theories are unique in that they both *describe what is* and *prescribe what we ought to seek*. These explanations describe our (fully realized) internal programming *as it is*. Following our (fully realized) internal programming leads to happiness, a life well-lived. Because we owe it to ourselves (ought) to *live good lives*, these explanations also prescribe what we ought to *seek*.”

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## Changes in Version 2003.08.31

### Preface, throughout

Changed “explain causation” to “explain.”

### Preface, tenth paragraph, last three sentences

“Friedman’s solution divided economics into theories that help us predict and normative theories, theories that help us formulate alternatives. The Austrians failed to rise to Friedman’s challenge by *abandoning the former in order to focus exclusively on the latter. They failed to rededicate themselves to explaining human action.*”

was changed to:

“The Austrians failed to rise to Friedman’s challenge by *rededicating themselves to developing intellectual tools for helping us formulate alternatives.*”

### Preface, fourteenth and fifteenth paragraphs

Changed “intellectual tool makers” to “intellectuals.”

### Preface, end

Added the following paragraph:

“Readers who are unfamiliar with the Toyota production system as a strategy for learning by doing ought to read the Appendix before reading the rest of this brief work.”

### Chapter 1, Modern Economics' Blind Spot, last paragraph, last sentence

“(Readers who are unfamiliar with the Toyota production system as a tool for inducing production technology ought to read the Appendix before proceeding.)”

was deleted.

### Chapter 1, The Recursionist Strategy, last paragraph, sixth sentence

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“(Consider the importance of the rule of law in decision-making.)”

was replaced by the following footnote:

“Consider the importance of the rule of law in decision-making: the rule of law increases the quality of decision-making by lowering the uncertainty associated with how authorities will respond to a given circumstance.”

### **Chapter 3, *Conclusion*, last sentence**

Dropped double quotation marks around “we.”

### **Chapter 3, *Eliminating Simplistic Theories*, last paragraph, last sentence**

Changed “owe it to ourselves” to “ought.”

### **Chapter 6, *Consider Incentives and Enforcement Costs*, title**

The title was changed to “*Consider the Justice of Interventions*.”

### **Chapter 6, *Fluid Relationships*, title**

The title was changed to “Free Association.”

### **Chapter 6, *Fluid Relationships*, last paragraph**

“In the long run, **fluid relationships** promote lucidity by encouraging the spread of practical wisdom.”

was changed to:

“In the long run, **free association** promotes lucidity by encouraging the spread of practical wisdom.”

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## **Changes in Version 2003.09.04**

### **Preface, eleventh paragraph, first two sentences**

“The major problem **with economic theories that explain** is both simple and straightforward: To be most effective in helping us formulate alternatives, **theories that explain** must be based on what we would do if we had complete knowledge of what we ought to seek.”

was changed to:

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“The major problem **in developing intellectual tools for helping us formulate alternatives** is both simple and straightforward: To be most effective, **intellectual tools for helping us formulate alternatives** must be based on what we would do if we had complete knowledge of what we ought to seek.”

### Chapter 1, Modern Economics’ Blind Spot, fourth paragraph, first sentence

“Concepts focus our attention on certain characteristics of objects, which **causes us** to ignore other characteristics.”

was changed to:

“Concepts focus our attention on certain characteristics of objects, which **tends to blind us** to other characteristics.”

### Chapter 1, Overview, third and fourth sentences

“*New Foundations* proposes new foundations for science and evolutionary explanations. *Eliminating Teleonomic Theories* provides means for tightening the loose theory on which the strategy rests.”

was changed to:

“*New Foundations* proposes new foundations for science and evolutionary **economic** explanations. *Eliminating Teleonomic Theories* provides **two** means for tightening the loose theory on which the strategy rests.”

### Chapter 2, Theories are refinements of everyday thinking., last paragraph

“Thus, we should judge **neoclassical** economics, which **aims** at helping us predict what happens in markets, by how well **it** helps us to predict what happens in markets. **Neoclassical** economics should stand ready to be proved less useful in helping us predict what happens in markets than competing theories. In contrast, we should judge evolutionary economic theories, which aim at helping us explain what happens in economies, by how well they help us formulate alternatives. These explanations should stand ready to be proved less useful in helping us formulate alternatives than competing explanations.”

was changed to:

“Thus, we should judge **marginalist** economic **theories**, which aim at helping us predict what happens in markets, by how well **they** help us to predict what happens in markets. **Marginalist** economic **theories** should stand ready to be proved less useful in helping us predict what happens in markets than competing theories. In contrast, we should judge **recursionist** economic theories, which aim at helping us explain what happens in economies, by how well they help us formulate alternatives. These explanations should

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stand ready to be proved less useful in helping us formulate alternatives than competing explanations.”

### **Chapter 2, Refining Evolutionary Explanations, title**

The title was changed to “Refining Recursionist Explanations.”

### **Chapter 2, Refining Recursionist Explanations, first paragraph, last sentence**

“The only school of economics that comes close to producing such theories is the Austrian school.”

was changed to:

“The only school of economics that comes close to producing such theories is the Austrian school **of evolutionary economics.**”

### **Appendix, *Traditional Manufacturing Systems*, last paragraph, last sentence**

Changed “to lower other costs” to “in order to lower other costs.”

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## **Changes in Version 2003.09.08**

### **Acknowledgments, first paragraph, second sentence**

Changed “GSB” to “Graduate School of Business.”

### **Acknowledgments, fifth paragraph, third sentence**

“After experiencing stagflation and hearing few objections to Nixon’s wage and price controls, which **came very close to bankrupting** my father’s manufacturing **company**, I vowed to stay as far away from Keynesian macroeconomics as possible. This meant taking every economics course taught by Jim, who I found to be the most inquisitive professor in the department.”

was changed to:

“After experiencing stagflation and hearing few objections to Nixon’s wage and price controls, which **caused the mill that supplied well over half of the paper to** my father’s printing company **to convert all production capacity to an uncontrolled paper product**, I vowed to stay as far away from Keynesian macroeconomics as possible. This meant taking every **microeconomics** course taught by Jim, who I found to be the most inquisitive professor in the department.”

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### Acknowledgments, seventh paragraph, last two sentences, eighth paragraph

“Understanding his popular works helped me better understand the dynamic balance of freedom and progress. This dynamic balance is what made the United States both great and the Great Satan: classical liberal progressive cultures tend to abandon their less wise traditions.

“Hayek exposed the practical problems of central planning. His goal was to demonstrate why socialism is fatally flawed. In contrast, I expose practical problems of capitalism, the free enterprise system as it is currently understood. My goal is to improve the free enterprise system by improving our understanding of enlightened self-interest.”

was changed to:

“Understanding his popular works helped me better understand the dynamic balance of freedom and progress that made the United States what it is today.”

### Chapter 2, *Theories produce predictions and explanations.*, last paragraph, fifth and sixth sentences

“In economics, we predict our behavior based on the knowledge that we currently possess. We could choose to explain our behavior on this same basis.”

was changed to:

“In economics, we predict our collective behavior based on the knowledge that we currently possess. We could choose to explain our individual behavior on this same basis.”

### Chapter 2, *Theories produce predictions and explanations.*, last paragraph, eighth sentence

Changed “creating knowledge” to “learning.”

### Chapter 2, *Theories produce predictions and explanations.*, last paragraph, end

Added the sentence:

“Failing to do so embeds ignorance into the economic system, which sets the stage for catastrophe.”

### Chapter 6, Introduction, last paragraph, last sentence

Changed “fluid relationships” to “free association.”



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### **Chapter 6, *Control the Money Supply Passively*, last paragraph, last sentence**

Added the sentence:

“In the long run, do we want economic agents to learn to adapt to unadulterated economic changes or to economic changes adulterated by activist monetary authorities?”

### **Chapter 6, *Free Association*, third paragraph, last sentence**

“**However**, the practical question for just policy makers **in information age economies** is not whether there is a trend toward lucidity, but how to promote such a trend **without dictating culture**.”

was changed to:

“**T**he practical question for just policy makers is not whether there is a trend toward lucidity but **rather** how to promote such a trend.”

### **Chapter 6, *Free Association*, fourth paragraph, last sentence**

“It also involves employers, and through authoritarian **progressive** legislation, the government, in the personal lives of employees.”

was changed to:

“It also involves employers, and through authoritarian legislation, the government, in the personal lives of employees.”

### **Chapter 6, *Free Association*, last paragraph**

“**In the long run**, free association **promotes** lucidity **by encouraging the spread of practical wisdom**.”

was changed to:

“**Fluid relationships allow** lucidity **to flourish**.”

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## **Changes in Version 2003.09.15**

### **Preface, fourth paragraph, end**

Added the following:

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“Frank Knight recognized this problem in his 1939 *Economica* article, *Ethics and Economic Reform*, which is reprinted in his book, *Freedom and Reform*.”

### Preface, fifth paragraph, first sentence

“The possibility of learning by doing makes this theoretical problem a very practical one.”

was changed to:

“The possibility of learning by doing makes Knight’s theoretical problem of moral philosophy a very practical one.”

### Chapter 2, *Theories produce predictions and explanations.*, first paragraph

“A prediction is knowledge of what is likely to happen under a particular set of conditions. An explanation is a deeper understanding that helps us predict what is likely to happen under a variety of conditions.”

was changed to:

“A prediction is knowledge of what is likely to happen under particular circumstances. An explanation is a deeper understanding that helps us predict what is likely to happen under a variety of circumstances, which includes predicting when making predictions becomes practically impossible for our given level of knowledge.”

### Chapter 2, first footnote, first paragraph

“Explanations are not simply predictions “written backwards.” Some theories explain relatively better than they predict and others predict relatively better than they explain. In *deterministic chaotic systems*, we can explain without being able to predict equally well. In these systems, small differences in initial conditions become ever greater over time. The further into the future we wish to predict, the more accurate our knowledge of initial conditions must be. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate,” which “emerges” from the complex interactions of matter and energy.”

was replaced by the following paragraph:

“The entire value of predictions and primary value of explanations stems from their usefulness in decision-making. In decision analysis terms, a prediction is knowledge that helps us assign probabilities to a given uncertain event and an explanation is knowledge that helps us formulate the model. The same knowledge that helps us formulate the model may also help us assign probabilities to uncertain events.

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However, this does not mean that the two types of knowledge are identical.

Explanations are not simply predictions “written backwards.””

“Some theories explain relatively better than they predict and others predict relatively better than they explain. In *deterministic chaotic systems*, we can explain without being able to predict equally well. **Mathematical models of deterministic chaotic systems explain why they are predictable at low levels of energy and why they become practically unpredictable at higher levels of energy.** The reason that they become practically unpredictable is that any deviation between actual initial conditions of these systems and our estimates of these conditions grows over time. In order to be able to predict these systems in their chaotic mode, we would have to know initial conditions with infinite precision. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate,” which “emerges” from the complex interactions of **the elements of the system.**”

### Chapter 2, *Theories are refinements of everyday thinking.*, second paragraph, last two sentences

“When talking about scientific theories that predict, they are careful to say that a set of factors *correlates with* rather than *causes* the result.”

was changed to:

“When talking about scientific theories that predict **but do not explain**, they are careful to say that a set of factors *correlates with* rather than *causes* the result.”

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## Changes in Version 2003.09.20

### Acknowledgments, last paragraph

“Students of F. A. Hayek will recognize the homage I paid him in the dedication. Although I finished my first draft before reading any of his works, I owe more to **him** than to any other economist. Understanding **his popular works** helped me better understand the dynamic balance of **freedom and progress that made the United States what it is today.**”

was changed to:

“Students of F. A. Hayek will recognize the homage I paid him in the dedication. Although I finished my first draft before reading any of his works, I owe more to **this self-proclaimed member of the party of life** than to any other economist. Understanding **the inconsistency between his conceptual framework and his ultimate end of the free evolution of life** helped me better understand the dynamic balance of **freedom and**

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progress at the core of the Scottish Enlightenment. Reconciling this inconsistency requires considering our spiritual needs without relying on the crutch of revealed truth.”

### Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph

Deleted “what happens in markets” and “what happens in economies” in all.

### Chapter 2, third footnote

“This instrumentalist concept of science addresses a common argument against Milton Friedman’s more limited instrumentalist concept, which is that Friedman’s concept would have rejected Copernicus’s theory of the solar system on the grounds that it did not predict as well as some contemporary Ptolemaic theories. Under this concept of science, Copernicus’s theory would have been rejected as a theory that predicts but not as theory that explains. Copernicus’s theory proved its worth as a theory that explains when it helped Kepler find a theory that predicted better than any Ptolemaic theory.”

was deleted.

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## Changes in Version 2003.09.24

### Acknowledgments, third to last paragraph, third sentence

“After experiencing stagflation and hearing few objections to Nixon’s wage and price controls, which **caused the mill that supplied well over half of the** paper to my father’s printing company **to convert all production capacity to an uncontrolled paper product**, I vowed to stay as far away from Keynesian macroeconomics as possible.”

was changed to:

“After experiencing stagflation and hearing few objections to Nixon’s wage and price controls, which **effectively cut off the supply of** paper to my father’s printing company, I vowed to stay as far away from Keynesian macroeconomics as possible.”

### Chapter 3

Extensive changes were made to this chapter, which were later deemed to be inadequate, if not dangerously misleading.

### Chapter 6, *Control the Money Supply Passively*, second paragraph, last two sentences

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“It buries the problem. In the long run, do we want economic agents to learn to adapt to **unadulterated** economic **changes** or to economic **changes** adulterated by activist monetary authorities?”

was changed to:

“It buries the **best** problem **to solve**. In the long run, do we want economic agents to learn to adapt to economic **turbulence** or to economic **turbulence modified** by activist monetary authorities?”

### Chapter 6, Conclusion, first paragraph, third sentence

Changed “a single simple trade-off” to “a simple trade-off.”

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## Changes in Version 2003.10.06

### Preface, fourth paragraph, last sentence

“Frank Knight recognized this problem in his 1939 *Economica* article, *Ethics and Economic Reform*, **which is reprinted in his book, *Freedom and Reform*.**”

was changed to:

“**(University of Chicago economist** Frank Knight recognized this problem in his 1939 *Economica* article, *Ethics and Economic Reform*.)”

### Preface, fifth paragraph, first sentence

“The possibility of learning by doing makes **Knight’s** theoretical problem of moral philosophy a very practical one.”

was changed to:

“The possibility of learning by doing makes **this** theoretical problem of moral philosophy a very practical one.”

### Preface, ninth paragraph, last two sentences

“**The** blame for this theoretical vacuum lies **as much** with members of the Austrian school **as it does with Friedman and his followers. The Austrians failed to rise to Friedman’s challenge by rededicating** themselves to developing intellectual tools for helping us formulate alternatives.”

was changed to:

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“**Ultimately**, the blame for this theoretical vacuum lies with members of the Austrian school **for failing to rededicate** themselves to developing intellectual tools for helping us formulate alternatives.”

### **Preface, fourth from last paragraph, first two sentences**

“This radical solution will be resisted by **those** intellectuals who define the markets for intellectual tools to exclude everything but theories. To **such people**, it takes a theory to beat a theory. They ought to consider the following argument:”

was changed to:

“This radical solution will be resisted by intellectuals who define the markets for intellectual tools to exclude everything but theories. To **these intellectuals**, it takes a theory to beat a theory. They ought to consider the following argument:”

### **Acknowledgments, last paragraph, third sentence**

“Understanding the inconsistency between his conceptual framework and his ultimate end of **the free evolution of life** helped me better understand the dynamic balance of freedom and progress at the core of the Scottish Enlightenment.”

was changed to:

“Understanding the inconsistency between his conceptual framework and his ultimate end of free **growth and spontaneous** evolution helped me better understand the dynamic balance of freedom and progress at the core of the Scottish Enlightenment.”

### **Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph**

“Thus, we should judge marginalist economic theories, which aim at helping us predict, by how well they help us predict. Marginalist economic theories should stand ready to be proved less useful in helping us predict than competing theories. In contrast, we should judge recursionist economic theories, which aim at helping us explain, by how well they help us formulate alternatives. These explanations should stand ready to be proved less useful in helping us formulate alternatives than competing explanations.”

was changed to:

“This pragmatic concept of science would have rejected Copernicus’s theory of the solar system as a theory that predicts because Copernicus’s theory did not predict as well as some contemporary Ptolemaic theories. However, it would not have rejected Copernicus’s theory as theory that explains. Copernicus’s theory later proved its worth as a theory that explains by helping Kepler find a theory that predicted better than any Ptolemaic theory.”

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## Chapter 3

Extensive changes were made to this chapter. The focus shifted to the problems raised by revealed truth.

### Afterword, last paragraph

Inserted the following paragraph:

“Conservative elites once claimed that the United States owed its success to their Protestant heritage. Their children claimed it was their Christian heritage. Their grandchildren claim it was their Judeo-Christian heritage. Their great-grandchildren will likely claim it was their Abrahamic heritage. *Because the ground is wet it must have rained.* The United States owes its success to its tradition of continuously improving natural law/ethics, which welcomes useful truth regardless of source.”

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## Changes in Version 2003.10.11

### Preface, first paragraph, first two sentences

“*Wealth in the Information Age, The Reintegration of Ethics and Economics* is the book that I wish I had read in George Leland Bach’s second year **MBA** normative economics course, *Business and the Changing Environment*. Dean Bach intended his course to be the capstone of our **Stanford Graduate School of Business** experience, the course that would connect everything we had learned into a coherent **structure**.”

was changed to:

“*Wealth in the Information Age, The Reintegration of Ethics and Economics* is the book that I wish I had read in George Leland Bach’s second year **Stanford Graduate School of Business** normative economics course, *Business and the Changing Environment*. Dean Bach intended his course to be the capstone of our **MBA** experience, the course that would connect everything we had learned into a coherent **whole**.”

### Preface, eighth paragraph, last sentence

“Freed from the constraint of realistic assumptions, economists can find new uses for their theories **throughout the life sciences**.”

was changed to:

“Freed from the constraint of realistic assumptions, economists can find new uses for their theories.”

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### **Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph**

“This pragmatic concept of science would have rejected Copernicus’s theory of the solar system as a theory that predicts because Copernicus’s theory did not predict as well as some contemporary Ptolemaic theories. However, it would not have rejected Copernicus’s theory as theory that explains. Copernicus’s theory later proved its worth as a theory that explains by helping Kepler find a theory that predicted better than any Ptolemaic theory.”

was changed to:

“Consider how we would have used this pragmatic approach to science to refine early modern theories about our solar system. Although Copernicus’s theory of planets traveling around the sun in circular orbits was simpler and more elegant, it could not predict quite as well as the best Ptolemaic theory, which had the sun and other planets traveling around the earth in epicyclical (“Spirographic”) orbits. We would have rejected Copernicus’s theory as a theory that predicts. However, we would not have rejected the idea of the planets traveling around the sun as a means of explaining the solar system. Like the digital approach to television in the early nineteen nineties, the heliocentric approach had advantages (simplicity and elegance) over Ptolemaic theories. Also like the digital approach to television in the early nineties, it was less thoroughly explored and so offered a greater possibility for improvement.

“Copernicus’s heliocentric approach proved its worth by helping Kepler formulate his theory of planets traveling around the sun in elliptical orbits. Kepler’s theory was superior to its contemporaries in simplicity, elegance, and ability to predict. We would not have rejected it as either a theory that predicts or one that explains. Instead, we would have used it to cull lesser theories in both categories.

“Kepler’s theory helped Newton formulate his theory of gravity. Given the greater depth and breadth of Newton’s theories of gravity and mechanics, we would not have rejected them as either theories that predict or ones that explain. However, Newton’s discovery that calculating the trajectories of the earth, moon, and sun was practically impossible would have prevented us from enshrining Newton’s theories as Alexander Pope did when he wrote:

Nature and Nature’s laws lay hid in night:  
God said, “Let Newton be!” and all was light.

“Today, scientists recognize Newton’s “three body problem” to be a deterministic chaotic system. Our solar system is not as predictable as those who worshipped at Newton’s altar believed it to be.”

### **Chapter 6, *Free Association*, last two paragraphs**



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“We are used to thinking about the moral hazards of insurance, people choosing to act foolishly because they are protected by insurance. We also **should** consider the potential moral encouragements of buying insurance. If people were free to buy insurance from any organization, many would choose to buy it from **those** that would help them live more wisely, e.g., religious and fraternal organizations. Organizations that successfully help people live more wisely would pass the savings on to their customers in the form of lower premiums, thereby attracting more people to their program. Those **insuring** organizations with a mandate to do good works would **use some of their savings to do so, thereby passing spiritual benefits on to their members.**

“Fluid relationships allow lucidity to flourish.”

was changed to:

“We are used to thinking about the moral hazards of **having** insurance, people choosing to act foolishly because they are protected by insurance. We also **ought to** consider the potential moral encouragements of buying insurance. If people were free to buy insurance from any organization, many would choose to buy it from **organizations** that would help them live more wisely, e.g., religious and fraternal organizations. Organizations that successfully help people live more wisely would pass the savings on to their customers in the form of lower premiums, thereby attracting more people to their program. Those organizations with a mandate to do good works would **pass spiritual benefits on to their insurance clients.**

“**Nothing is more useful to a human than another human ruled by lucidity.** Fluid relationships allow lucidity to flourish.”

### Afterword, first paragraph and closing

Changed “nearly four years ago” to “nearly five years ago.” Also dropped October 2002 date at end of the section.

Changed “OODA” to “Colonel John Boyd’s OODA (observation-orientation-decision-action).”

### Afterword, second to last paragraph, last two sentences

“*Because the ground is wet it must have rained.* **The United States owes its success to its tradition of continuously improving natural law/ethics, which welcomes useful truth regardless of source.**”

was changed to:

“**A more useful explanation is that** the United States actually owes its success to its tradition of **freedom and progress toward an end defined by human nature**, which welcomes useful truth regardless of **its** source.”

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## Afterword, last paragraph, first sentence

“Classical liberal progressivism is the essence of American idealism.”

was changed to:

”This tradition of freedom and progress is the essence of American idealism.”

## Afterword, last paragraph

Eliminated italics for “process conservatives” and “state-of-the-world conservatives.”

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## Changes in Version 2003.10.23

### Preface, second paragraph, second sentence

Added the phrase: “under its first six Secretaries.”

### Preface, third paragraph, second sentence

Changed “outside of all the boxes” to “outside all of the boxes.”

### Preface, fourth paragraph, last sentence

“(University of Chicago economist Frank Knight recognized this problem in his 1939 *Economica* article, *Ethics and Economic Reform*.)”

was moved the the end of the fifth paragraph.

### Preface, sixth paragraph, second to the last sentence

“Whether economic agents seek what is most efficient or something else doesn’t matter. What matters is whether models based on a given theory predict better than models based on competing theories.”

was changed to:

“Whether economists assume that economic agents seek what is most wise, most efficient, or most traditional doesn’t matter. What matters is how well their models predict relative to other models.”

### Preface, third to the last paragraph, second sentence

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“These intellectuals also ought to **think carefully about who it is that ultimately defines** the market for intellectual tools. **In the market for intellectual production tools, consumers of intellectual tools** decided that Toyota’s learning by doing production strategy was better than production theories that focused on allocating scarce resources efficiently.”

was changed to:

“These intellectuals also ought to **consider what happened in** the market for intellectual production tools. **Consumers** decided that Toyota’s learning by doing production strategy was better than production theories that focused on allocating scarce resources efficiently.”

### **Acknowledgments, last paragraph, last sentence**

“Reconciling this inconsistency requires considering our spiritual needs **without relying on the crutch of revealed truth.**”

was changed to:

“Reconciling this inconsistency requires considering our spiritual needs.”

### **Chapter 2, Theories are refinements of everyday thinking., last paragraph, last sentence**

Changed “altar” to “shrine.”

### **Chapter 3, Eliminating Teleonomic Theories, second to last paragraph, end**

Added the following paragraphs:

“We also need to distinguish between ethics and religion. Ethics concerns how we live good lives. Religion concerns how we mystically unite with something greater than ourselves. The words that several major religions use to define this concern reflect this aim: ‘religion’ comes from the Latin word that means to relink; ‘yoga’ comes from the Sanskrit word that means to yoke; and ‘Islam’ comes from the Arabic word that means to submit (to the will of God). From this perspective, the statement that atheist Soviet Communism was a secular religion is more than a metaphor. It is a statement of fact.”

### **Chapter 3, Ultimate Normative Ends of Life, first two paragraphs**

“Humanists look to human nature (teleonomic theories) to explain our ultimate ends and the best means to them. **To think clearly about our ultimate ends and the best means to them, we need to distinguish between ethics and religion. Ethics concerns how we live good lives. Ethics is secular (worldly) in that it concerns matters of this world. Religion concerns how we mystically unite with something greater than**

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ourselves. The words that several major religions use to define this concern reflect this aim: ‘religion’ comes from the Latin word that means to relink; ‘yoga’ comes from the Sanskrit word that means to yoke; and ‘Islam’ comes from the Arabic word that means to submit (to the will of God). From this perspective, the statement that atheist Soviet Communism was a secular religion is more than a metaphor. It is a statement of fact. Soviet Communism competed against other religions in helping us mystically unite with something greater than ourselves.

“Humanist philosophers believe that the ultimate end of human life is happiness, which they define as a good life, a life well lived. They claim that the statement, “the ultimate end of life is a good life,” has meaning, as opposed to simply being true by definition. To have meaning, a statement must tell us something more than is contained in the statement alone. In this case, the statement has meaning because it focuses our attention on what we need in order to live a good life.”

were merged into:

“Humanists look to human nature (teleonomic theories) to explain our ultimate ends and the best means to them. They believe that the ultimate end of human life is happiness, which they define as a good life, a life well lived. They claim that the statement, “the ultimate end of life is a good life,” has meaning, as opposed to simply being true by definition. To have meaning, a statement must tell us something more than is contained in the statement alone. In this case, the statement has meaning because it focuses our attention on what we need in order to live a good life.”

### Chapter 3, Ultimate Normative Ends of Life, fifth to the last paragraph

“Schweitzer explains that humans have a need for mystical oneness — a religious impulse — that we can satisfy by relinking to the infinite Being by either renouncing or embracing the world and life. This explanation is logical in that it follows the rules for philosophical theories. However, it is flawed in that it presumes the existence of the infinite Being when this metaphysical assumption is not necessary to explain what it explains. This violates the philosophical standard of beauty known as Occam’s razor. We can easily correct this flaw by eliminating this assumption. The corrected explanation is that humans have a need for mystical oneness that we satisfy either by embracing the world and life or by embracing the complete absence of the world and life (oblivion).”

was shifted to the end of the section, where it replaced:

“Moral philosopher John Rawls provides a means of judging the justice of Schweitzer’s normative ultimate end of reverence for life. Rawls asks us to imagine what rules we would choose to govern us if we were ignorant of the circumstances of our birth.<sup>5</sup> For this imagined original position of ignorance to produce a *complete* theory of justice, we must consider what rules we would want to guide intelligent life if we were *completely* ignorant of the circumstances of our birth, which includes

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ignorance of what species we will be and into what era we will be born.<sup>6</sup> Under these conditions we would want intelligent beings to satisfy their needs efficiently as this minimizes killing and suffering. We would also want intelligent beings to devote themselves to helping other life survive and thrive (with preference given to other intelligent life). In short, we would want intelligent life to live by Schweitzer's normative end of reverence for life."

### **Chapter 3, Practical Benefits of Magical Mysticism, last three paragraphs**

"The experience of the transcendent state of mystical oneness by means of magical mysticism may result in a more integrated, coherent, and useful belief system. This more useful belief system may in turn result in a permanently higher state of being.

"Religious orders and cults have long used this knowledge to educate their initiates. The procedure involves immersing initiates in teachings and then inducing altered state of consciousness capable of reordering belief systems. Inducing an altered state of consciousness strong enough to change belief systems requires breaking the stream of words that define normal consciousness. Techniques include the use of drugs, extreme fear, extreme fatigue, extreme pain, extreme (ecstatic) activity, deprivation, and meditation. Secular education and reeducation programs such as military boot camps, graduate and professional schools, and political indoctrination programs also use this procedure.

"The dangers of inducing altered states of consciousness and the diversion of time and energy from satisfying our needs tends to divide those religious leaders and organizations that promote ethical behavior from those who promote transcendent experience. While actively seeking transcendent experience can be dangerous and wasteful, denying it can be as dangerous and wasteful. Religious movements that deny transcendent experience risk becoming dogmatic, bureaucratic, legalistic, and empty. Healthy religious movements seek transcendent experience prudently."

were changed to:

"The experience of the transcendent state of mystical oneness by means of magical mysticism may result in a more integrated, coherent, and useful belief system. This more useful belief system may in turn result in a permanently higher state of being.

"We commonly associate this sort of change in belief system with spontaneous religious conversions in which the transcendent experience precedes the change in beliefs. These experiences raise thorny metaphysical issues concerning revealed truth, which make them relatively inaccessible to inquiry.

"More accessible to inquiry are major epiphanies in which the changes in beliefs precede or accompany transcendent experience. The classic example is the exhilaration Archimedes felt upon understanding the relationship between the volume of his body, the volume of water displaced by his body, and the density of his body relative to that

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of water. These major epiphanies raise the question of whether a small change in beliefs elevates consciousness, which in turn triggers further changes in beliefs.

“We experience this elevation in consciousness when we laugh at a joke that plays on inconsistencies in our belief systems, especially when they play on underlying concepts. We laugh when a child asks why freedom fighters fight freedom. We also laugh when the three stooges throw away artwork described as being priceless because they confuse being priceless with being worthless. This laughter briefly lifts us out of our normal state of consciousness. Chan (Zen) Buddhist masters have long used this insight to elevate the consciousness of their students in the hope of triggering enlightenment.

“If changes in belief systems, especially in the meaning of concepts, elevate consciousness and the increased clarity and energy of elevated consciousness encourages further changes in beliefs, then it may be useful to think of major epiphanies as avalanches that release stress within belief systems. Changing a single anomaly in a belief system rife with anomalies may trigger massive and virtually immediate changes throughout the system.

“Not all transformations in belief systems involving altered states of consciousness are spontaneous. Religious orders, cults, fraternal organizations, militaries, professional schools, graduate schools, and political re-education centers have used altered states of consciousness to indoctrinate people. The indoctrination procedure consists of memorizing prescribed material, inducing an altered state of consciousness, and testing the resulting belief system. Inducing an altered state of consciousness strong enough to change belief systems requires breaking the stream of words that define normal consciousness. Techniques include the use of drugs, extreme fear, extreme fatigue, extreme pain, extreme (ecstatic) activity, deprivation, and meditation.

“Understanding such transformations helps us reconcile the reasonable (Apollonian) and emotional (Dionysian) approaches to life. Redeeming Apollonian art encourages life-affirming (uplifting) values. Redeeming Dionysian art shocks us into confronting life-denying values. Both aim at improving our belief systems.

“Although actively seeking transformation by means of transcendent experience can be dangerous and wasteful, failing to seek it can be equally dangerous and wasteful. Cultures that actively deny transformation through transcendence inevitably become dogmatic and empty, which makes them ripe for Dionysian revolution. Healthy cultures balance the Apollonian and Dionysian by seeking life-affirming transformations prudently.”

### **Chapter 3, *Ritual Death***

This section was replaced by the *Revealed Truth* section:

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“The preceding arguments focused on individuals. Focusing on the universe as a whole leads to different problems, arguments, and conclusions. For example, the most simple and straightforward theories for explaining the creation of the universe assume the existence of a Creator. Occam’s razor cuts both ways.

“The existence of a Creator who reveals truths to us about the universe and our place in it does not eliminate our uncertainty about how we ought to live. How do we know pronouncements of divine law are the word of the Creator? How do we know that we have interpreted them correctly? Jesus tells us to judge them: “By their fruits you shall know them.” (Mathew 7:16).

“Moral philosopher John Rawls provides a means of judging theories about how we ought to live. Rawls asks us to imagine what theories we would choose if we were ignorant of the circumstances of our birth.<sup>10</sup> For this imagined original position of ignorance to produce a complete theory of justice, we must consider what rules we would want to guide intelligent life if we were completely ignorant of the circumstances of our birth, which includes ignorance of what species we will be and into what era we will be born.<sup>11</sup> Under these conditions we would want intelligent beings to satisfy their needs efficiently as this minimizes killing and suffering. We would also want intelligent beings to devote themselves to helping other life survive and thrive (with preference given to other intelligent life). In short, we would want intelligent life to pursue Schweitzer’s normative end of reverence for life.”

“<sup>10</sup> Rawls, John, *A Theory of Justice*, (Cambridge, MA: The Belknap Press of Harvard University, 1971).”

“<sup>11</sup> Anything less than complete ignorance will introduce bias. For example, if we simply imagine that we were born into our current society, we will tend to ignore the potential affect of our behavior on members of other human societies, future generations of humans, and non-human life. Using Rawls’s means, we can argue that incomplete forms of ethical mysticism permit unjust predation and exploitation. We also can argue that they permit unjust limitations on cooperation. The most obvious examples are restrictions on “foreign” trade. These limit cooperation with living members of other societies. Less obvious are actions that effectively limit cooperation with future generations of intelligent life.

“Justice requires a recursive agreement between generations similar in form and spirit to the Confucian canon that we ought to pay the debts that we owe our ancestors to our descendants. Each generation must seek to maximize the amount of progress for the turbulence it can bear. Shielding a favored group from change violates this agreement. The basis of this complete concept of justice is not a social contract but rather a contract between all intelligent life for the benefit of all life. For those who believe that all life contains an element of the infinite Being, it is a contract with the infinite Being.

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“Whenever we are tempted to use ‘social justice’ we ought to substitute ‘tribal justice’ in order to remind ourselves and others that we refer to an inherently incomplete concept of justice.”

### **Chapter 3, Conclusion**

“Materialist and dualists can find common ground in the ultimate normative end of **a good life for all**. If we accept this **ultimate normative** end, we can develop rules for eliminating teleonomic theories that aim too low. For example, we can eliminate teleonomic theories based on too narrow a **conception** of who we are.”

was changed to:

“Materialist and dualists can find common ground in the ultimate normative end of **reverence for life**. If we accept this end, we can develop rules for eliminating teleonomic theories that aim too low. For example, we can eliminate teleonomic theories based on too narrow a **definition** of who we are.”

### **Chapter 3, Eliminating Simplistic Theories, second to last paragraph, fourth sentence**

“This creates the incentive to deny **the reality of** its ineffectiveness.”

was changed to:

“This creates the incentive to deny its ineffectiveness.”

### **Chapter 3, Summary, second to last paragraph, fourth sentence**

“This creates the incentive to deny **the reality of** its ineffectiveness.”

was changed to:

“This creates the incentive to deny its ineffectiveness.”

We can also agree on a foundation for arguments about human rights: Our human rights arise from our obligation to pursue the normative end of a good life for all.

### **Chapter 5, Introduction, first paragraph, first sentence**

Changed “experience of profound bliss” to “transcendent experience.”

### **Chapter 5, Introduction, fifth paragraph**

“The information revolution’s ever increasing potential for rapid learning exacerbates **both of** these measurement problems. **All** consumer goods and services **are** means to a



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good life rather than ends in themselves. Thus, the problem of measuring inputs rather than outputs is universal. Worse, **assessing the value of human action according to how well it satisfies our needs is more difficult than assessing the value of a good or service according to more concrete criteria.**”

was changed to:

“The information revolution’s ever increasing potential for rapid learning exacerbates these measurement problems. **Because people living good lives learn more rapidly than people living poor lives, efficiency in consumption is more important in economies with the potential for rapid learning than in economies without this potential. Focusing on efficiency in consumption requires viewing consumer goods and services as means to a good life rather than ends in themselves. Therefore,** the problem of measuring inputs rather than outputs is universal. Worse, **measuring the satisfaction of consumer needs is far more difficult than measuring the satisfaction of consumer wants, which economists are able to do by assuming that consumer preferences remain constant over the period under consideration.**”

### Chapter 6, Just Taxation, last paragraph, last sentence

“High on this list are taxes on profits, which discourage acquiring knowledge and taking risks.”

was changed to:

“High on this list are taxes on profits **(including personal income)**, which discourage acquiring knowledge and taking risks. **Rather than taxing profits progressively, governments ought to tax detrimental environmental impact progressively.**”

### Afterword, second and third to the last paragraph

“Recognizing this dynamic exposes problems on both sides of the current political divide. **For conservatives, the major problem is that the dynamic continues only if each generation chooses increasingly “feminine” ends. At the logical limit is a Albert Schweitzer’s normative end of reverence for life.** For liberals, the major problem is that this dynamic requires “masculine” means. An ultimate end based on reverence for life requires unending progress, hence unending turbulence. Thriving under these conditions requires “masculine” qualities. A nanny state that protects its charges by eliminating change shuts down the dynamic. **Regardless of the cause, retarding this progressive dynamic** is unjust to our future selves, other societies, future generations, and other species.

“Conservative elites once claimed that the United States owed its success to their Protestant heritage. Their children claimed it was their Christian heritage. Their grandchildren claim it was their Judeo-Christian heritage. Their great-grandchildren will likely claim it was their Abrahamic heritage. A more useful explanation is that the

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United States owes its success to its tradition of freedom and progress toward **an end defined by human nature, which welcomes useful truth regardless of its source.**”

was changed to:

“Recognizing this dynamic exposes problems on both sides of the current political divide. For liberals, the major problem is that this dynamic requires “masculine” means. An ultimate end based on reverence for life requires unending progress, hence unending turbulence. Thriving under these conditions requires “masculine” qualities. A nanny state that protects its charges by eliminating change shuts down the dynamic. **This** is unjust to our future selves, other societies, future generations, and other species.

**“For conservatives, the major problem is that the dynamic continues only if each generation chooses increasingly inclusive ends.** Conservative elites once claimed that the United States owed its success to their Protestant heritage. Their children claimed it was their Christian heritage. Their grandchildren claim it was their Judeo-Christian heritage. Their great-grandchildren will likely claim it was their Abrahamic heritage. A more useful explanation is that the United States owes its success to its tradition of freedom and progress toward **the normative end of reverence for life.**”

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### Changes in Version 2003.10.26

#### **Preface, seventh and eighth paragraphs**

“Limiting economic science to theories that predict has two effects. The primary effect is to limit the usefulness of economic science. Theories that predict help us assign probabilities to uncertain events, thereby helping us evaluate alternatives. In contrast, theories that explain help us think clearly about what happens in economies, thereby helping us formulate alternatives. Limiting economic science to theories that predict forces us to find another means of thinking about what happens in economies. From his popular works and public lectures, we know that Friedman thinks about economies as complex adaptive systems that emerge from the decision-making of individual economic agents. He focuses on decision-making, not on allocating scarce resources.

“The secondary effect of limiting economic science to theories that predict is to expand the scope of economic science. Freed from the constraint of realistic assumptions, economists can find new uses for their theories.”

were deleted.

#### **Preface, new seventh paragraph, third sentence**

Inserted the following sentence:

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“(In decision analysis, theories that predict help us assign probabilities to uncertain events and theories that explain help us draw the decision trees.)”

### **Acknowledgments, last paragraph, last two sentences**

“Understanding the inconsistency between his conceptual framework and his ultimate end of free growth and spontaneous evolution helped me better understand the dynamic balance of freedom and progress at the core of the Scottish Enlightenment. **Reconciling this inconsistency requires considering our spiritual needs.**”

were changed to:

“ Understanding the inconsistency between his conceptual framework and his ultimate end of free growth and spontaneous evolution **of culture and organization** helped me better understand the dynamic balance of freedom and progress at the core of the Scottish Enlightenment.”

### **Chapter 3, *Revealed Truth*, title**

Changed title to “*Divine Law*.”

### **Chapter 3, *Divine Law*, second paragraph, last sentence**

“Jesus tells us to judge them: “By their fruits you shall know them.” (Mathew 7:16).”

was changed to:

“Jesus tells us to judge them **by their usefulness**: “By their fruits you shall know them.” (Mathew 7:16).”

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## **Changes in Version 2003.10.30**

### **Preface, sixth paragraph, first sentence**

Changed “In his most cited work,” to “In his most cited **academic** work,”

### **Preface, seventh paragraph, third sentence**

“(In decision analysis, theories that predict help us assign probabilities to uncertain events and theories that explain help us draw the decision trees.)”

was deleted.

### **Preface, seventh paragraph, last sentence**

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“Ultimately, the blame for this theoretical vacuum lies with members of the Austrian school for failing to rededicate themselves to developing intellectual tools for helping us formulate alternatives.”

was deleted.

### **Preface, second to last paragraph, second sentence**

“Today, the Toyota production system demonstrates the wisdom of pursuing the virtuous circle of increasing excellence in **production and trade** and increasing excellence in **consumption**.”

was changed to:

“ Today, the Toyota production system demonstrates the wisdom of pursuing the virtuous circle of increasing excellence in **consumption** and increasing excellence in **production and trade**.”

### **Preface, last paragraph**

“Readers who are unfamiliar with the Toyota production system as a strategy for learning by doing ought to read the appendix before reading the rest of this brief work.”

was deleted.

### **Chapter 2, *Theories produce predictions and explanations.*, second paragraph, third sentence**

Inserted the following sentence:

“In decision analysis terms, we use predictions to assign probabilities to uncertain events and explanations to help us draw decision trees.”

### **Chapter 3, *Ultimate Normative Ends of Life*, first paragraph**

“Humanists look to human nature (teleonomic theories) to explain **our ultimate ends and the best means to them**. They believe that the ultimate end of **human life** is happiness, **which they define as a good life, a life well lived**. They claim that the statement, “the ultimate end of life is a good life,” has meaning, as opposed to simply being true by definition. To have meaning, a statement must tell us something more than is contained in the statement alone. In this case, the statement has meaning because it focuses our attention on what we need in order to live a good life.”

was changed to:

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“Humanists look to human nature (teleonomic theories) to explain **human** ends. They believe that the ultimate normative end of human life is **living a good life** (happiness). **Some humanists believe that this is self-evident. This ignores the possibility that the ultimate normative end of life and the ultimate normative end of existence may not be the same thing. For the statement “the ultimate normative end of human life is living a good life” to be true, it must be true by definition. For this statement to be true by definition, living a good life must include all temporal worldly ends necessary to achieve the ultimate end of human existence. Further, living a good life must be logically consistent with these temporal ends.**

“**Humanist philosophers** claim that the statement, “the ultimate end of **human** life is a good life,” has meaning, as opposed to simply being true by definition. To have meaning, a statement must tell us something more than is contained in the statement alone. In this case, the statement has meaning because it focuses our attention on what we need in order to live a good life.”

### Chapter 3, Practical Benefits of Magical Mysticism, third paragraph, third sentence

“We see this clearly in the “effortless effort” doctrine of Zen Buddhism.”

was deleted.

### Chapter 3, Practical Benefits of Magical Mysticism, third paragraph, last sentence

“This detachment of consciousness from action and results is also found”

was changed to:

“We also find this practical benefit of magical mysticism”

Moved quotations into footnotes.

### Chapter 6, Just Taxation

“All forms of taxation disrupt the process of decision-making. Just forms disrupt it in ways that promote progress by creating incentives to act wisely.

“The most obvious forms of just taxation are those that discourage undesirable activities. These include taxes on consuming tobacco and **polluting** the environment. Less obvious are those that induce the creation of useful knowledge. For example, **the United States** can induce **new** useful knowledge that replaces oil **with tolerable** turbulence by slowly escalating taxes on oil. **In addition to lowering the demand for oil, this will provide an example of inducing new knowledge by means of just taxation. Over time, inducing such knowledge will reduce the risk of war over oil and other scarce resources.**

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“The least beneficial taxes are those that discourage desirable activities. High on this list are taxes on **profits (including personal income)**, which discourage acquiring knowledge and taking risks. Rather than taxing **profits** progressively, governments ought to tax detrimental **environmental impact** progressively.”

were changed to:

“All forms of taxation disrupt the process of decision-making. Just forms disrupt it in ways that promote progress by creating incentives to act wisely. **We owe it to ourselves to demand that governments tax us as justly as current information technology permits.**

“The most obvious forms of just taxation are those that discourage undesirable activities. These include taxes on consuming tobacco and **damaging** the environment. Less obvious are those that induce the creation of useful knowledge. For example, **governments** can induce the creation of useful knowledge that replaces oil **by taxing the consumption of oil. Trustworthy governments can minimize turbulence by escalating taxes over a long enough period to allow consumers to adjust gradually to the new environment.**

“The least beneficial taxes are those that discourage desirable activities. High on this list are taxes on **incomes (profits)**, which discourage acquiring knowledge and taking risks. Rather than taxing **incomes** progressively, **we ought to demand that** governments tax detrimental **forms of consumption** progressively.”

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### Changes in Version 2003.11.03

#### Preface, first paragraph

“*Wealth in the Information Age, The Reintegration of Ethics and Economics* is the book that I wish I had read in George Leland Bach’s **second year Stanford Graduate School of Business** normative economics course, *Business and the Changing Environment*. Dean Bach intended his course to be the capstone of our MBA experience, the course that would connect everything we had learned into a coherent whole. **His means to this end involved relentlessly questioning our solutions to a series of business school cases** without ever revealing what he believed to be the best decision alternative. It was only **on the final day of the course** that he described the three rules he used to test the morality of decision alternatives.”

was changed to:

“*Wealth in the Information Age, The Reintegration of Ethics and Economics* is the book that I wish I had read in George Leland Bach’s normative economics course, *Business and the Changing Environment*. Dean Bach intended his course to be the capstone of our **Stanford** MBA experience, the course that would connect everything

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we had learned into a coherent whole. **From the first day until the last, Bach relentlessly questioned our solutions to case studies** without revealing his beliefs. It was only **after we finished the last case** that he **cautiously recommended** three rules that he used to test the morality of decision alternatives.”

### Acknowledgments, last paragraph, last sentence

“Understanding the inconsistency between his conceptual framework and his ultimate end of free growth and spontaneous evolution **of culture and organization** helped me better understand the dynamic balance of freedom and progress at the core of the Scottish Enlightenment.”

was changed to:

“Understanding the inconsistency between his conceptual framework and his ultimate end of free growth and spontaneous evolution helped me better understand the dynamic balance of freedom and progress at the core of the Scottish Enlightenment. **It has led me back not to the skepticism of David Hume but rather to the common sense of Thomas Reid.**”

### Chapter 3, Ultimate Normative Ends of Life, fifth paragraph, fourth sentence

“He found that these people seek to make the most of their talents in pursuit of goals that concern **such universals as truth, justice, and beauty.**”

was changed to:

“ He found that these people seek to make the most of their talents in pursuit of goals that concern **the transcendent values** of truth, **beauty**, and **the good (justice).**”

### Chapter 3, Conclusion

Inserted the section titled **Sacrifice versus Prudence.**

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## Changes in Version 2003.11.08

### Preface, seventh paragraph, third sentence

Changed “most traditional” to “something else.”

### Acknowledgments, third paragraph, first sentence

Changed “truth” to “useful truth.”

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### Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph

“Today, scientists recognize Newton’s “three body problem” to be a deterministic chaotic system. **Our solar system** is not as predictable as those who worshipped at Newton’s shrine believed it to be.”

was changed to:

“Today, scientists recognize Newton’s “three body problem” to be a deterministic chaotic system. **They also recognize that the complex interactions of the universe occasionally result in large asteroids colliding with earth.** The universe is not as predictable as those who worshipped at Newton’s shrine believed it to be.”

### Chapter 3, *Practical Benefits of Magical Mysticism*, last two paragraphs

“Understanding such transformations helps us reconcile the reasonable (Apollonian) and emotional (Dionysian) approaches to life. Redeeming Apollonian art encourages life-affirming (uplifting) values. Redeeming Dionysian art shocks us into confronting life-denying values. Both aim at improving our belief systems.

“Although actively seeking transformation by means of transcendent experience can be dangerous and wasteful, failing to seek it can be equally dangerous and wasteful. Cultures that actively deny transformation through transcendence inevitably become dogmatic and empty, which makes them ripe for Dionysian revolution. Healthy cultures balance the Apollonian and Dionysian by seeking life-affirming transformations prudently.”

were deleted.

Footnote #9 becomes footnote #11 below.

### Chapter 3, *Sacrifice versus Prudence*, second paragraph

“Some means of achieving mystical oneness sacrifice safety or health in order to economize on other scarce resources. Most successful religions include beliefs that serve to check these extreme **Dionysian** means. Examples include the belief that (1) we have as many lifetimes as it takes to achieve mystical union, (2) we can achieve the ultimate end of existence in an existence after death (e.g., purgatory), and (3) we can achieve the ultimate end of existence through revering life as well as through the temporal end of mystical union. The one area in which extreme **Dionysian** means to mystical oneness remains unchecked is when it coincides with the normative end of reverence for life. Even here, **successful religions** teach us to **balance the extreme Dionysian with the Apollonian**. Too small a willingness to risk ourselves for the sake of others is deemed to be cowardly. Too great a willingness to risk ourselves for others is deemed to be foolhardy or self-destructive. Only the proper balance is deemed to be heroic.”



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was changed to:

“Some means of achieving mystical oneness sacrifice safety or health in order to economize on other scarce resources. Most successful religions include beliefs that serve to check these extreme means. Examples include the belief that (1) we have as many lifetimes as it takes to achieve mystical union, (2) we can achieve the ultimate end of existence in an existence after death (e.g., purgatory), and (3) we can achieve the ultimate end of existence through revering life as well as through the temporal end of mystical union. **As Maslow observed, healthy religions balance the Dionysian (emotional) and Apollonian (reasonable) means to mystical experience.<sup>11</sup> They seek life-affirming transformations prudently.** The one area in which extreme means to mystical oneness remains unchecked is when it coincides with the normative end of reverence for life. Even here, **the wise** teach us **to seek balance**. Too small a willingness to risk ourselves for the sake of others is deemed to be cowardly. Too great a willingness to risk ourselves for others is deemed to be foolhardy or self-destructive. Only the proper balance is deemed to be heroic.”

### Chapter 3, Sacrifice versus Prudence, second to last paragraph, last sentence

“In illiberal **societies**, heroism **is more useful than** wisdom.”

was changed to:

“Illiberal **leaders promote sacrifice over prudence, romance over enlightenment, and heroism over** wisdom.”

### Chapter 3, Sacrifice versus Prudence, last paragraph, last sentence

“In liberal **societies**, wisdom **is more useful than** heroism.”

was changed to:

“The wise temper sacrifice with prudence, romance with enlightenment, and heroism with wisdom.”

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## Changes in Version 2003.11.12

### Preface, second paragraph, second sentence

Deleted “Pomona College.”

### Preface, third to last paragraph, last two sentence

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“**Because** no theory can address the uncertainty of all of its own fundamental propositions, **addressing** all uncertainties associated with any given theory requires introducing a more complete theory. Thus, a complete conceptual system for helping us formulate alternatives must be based **not on a theory but rather** on a strategy for solving an open-ended problem that addresses all uncertainty.”

was changed to:

“**No** theory can address the uncertainty of all of its own fundamental propositions. **Addressing** all uncertainties associated with any given theory requires introducing a more complete theory. Thus, a complete conceptual system for helping us formulate alternatives must be based on a strategy for solving an open-ended problem.”

### Acknowledgments, fifth paragraph, third sentence

“ I vowed to **stay as far away from Keynesian** macroeconomics **as possible**.”

was changed to:

“ I vowed to **take no elective** macroeconomics **courses**.”

### Acknowledgments, last paragraph, last sentence

“It has led me back not to the skepticism of David Hume but rather to the common sense of Thomas Reid.”

was deleted.

### Chapter 1, The Recursionist Strategy, last paragraph, third sentence

Changed “practical wisdom,” to “practical wisdom — ”.

### Chapter 2, Theories produce predictions and explanations., first paragraph, last sentence

“An explanation is a deeper understanding that helps us predict what is likely to happen under a variety of circumstances, *which includes predicting when making predictions becomes practically impossible for our given level of knowledge.*”

was changed to:

“An explanation is knowledge of why things happen as they do.”

Replaced the footnote with the second two paragraphs in the footnote (changes in red):

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“Some theories explain relatively better than they predict and others predict relatively better than they explain. In *deterministic chaotic systems*, we can explain without being able to predict equally well. Mathematical models of deterministic chaotic systems explain why they are predictable at low levels of energy and why they become *practically* unpredictable at higher levels of energy. The reason that they become practically unpredictable is that any deviation between actual initial conditions of these systems and our estimates of these conditions grows over time. In order to be able to predict these systems in their chaotic mode, we would have to know initial conditions with infinite precision. Our inability to know initial conditions precisely limits our ability to predict the trajectory of the system, the “weather.” In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate,” which “emerges” from the complex interactions of the elements of the system.

“Other theories predict relatively better than they explain: Quantum mechanics provides **incredibly** accurate statistical predictions of subatomic events without explaining their causes equally well. Rather than better means of predicting what quantum mechanics predicts, physicists currently seek to explain what links subatomic phenomena and cosmological phenomena, **e.g., string theory.**”

### Chapter 2, Theories are refinements of everyday thinking., first paragraph, last sentence

Deleted “our experiences.”

### Chapter 2, Theories are refinements of everyday thinking., fifth paragraph, first sentence

“We refine the set of philosophical theories by rejecting those that fail to meet empirical standards for explaining. **our experiences.**”

was changed to:

“We refine the set of philosophical theories by rejecting those that fail to meet empirical standards for explaining. **Unlike previous refinements, this one is an ongoing process that requires us not only to reject candidates but also to reject previously accepted theories in light of new information and newly accepted theories.**”

### Chapter 2, Theories are refinements of everyday thinking., sixth paragraph, second sentence

Inserted the following sentence:

“Like the previous refinement process, this one is an ongoing process that requires us not only to reject candidates but also to reject previously accepted theories in light of new information and newly accepted theories.”

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## **Chapter 3, Eliminating Teleonomic Theories, last paragraph, fifth sentence**

Changed “atheist Soviet Communism” to “Marxist-Leninism.”

## **Chapter 3, Ultimate Normative Ends of Life, twelfth paragraph, last sentence**

Changed “universal truth, beauty, and justice” to “the transcendent values of the truth, beauty, and the good.”

## **Chapter 3, Practical Benefits of Magical Mysticism, first paragraph, second sentence**

Changed “he saw ” to “Schweitzer saw.”

## **Chapter 3, Sacrifice versus Prudence, last paragraph, third and fourth sentences**

“They also recognize that the need for **heroism** arises from **poverty**. **If everyone had everything they need, there would be no need to sacrifice for others.**”

was changed to:

“They also recognize that the need for **sacrifice** arises from **unsatisfied needs**.”

## **Chapter 4, Human Capital, Work, and Leisure, last paragraph, second sentence**

“The wise manager knows that it is in everyone’s best interest to help subordinates find **what work best suits them** and to make all work as **satisfying** as possible.”

was changed to:

“The wise manager knows that it is in everyone’s best interest to help subordinates find work **that they enjoy** and to make all work as **enjoyable** as possible.”

## **Chapter 5, Economic Viscosity, first paragraph, second and third sentences**

“Fluid economies are those that readily adapt to economic stress of progress. Economic fluidity concerns the quality of decision-making, **the process that begins with finding a problem to solve and ends with implementing the chosen solution.**”

was changed to:

“Fluid economies are those that readily adapt to **the** economic stress of progress. Economic fluidity concerns the quality of decision-making.”

## **Afterword, second to last paragraph, last sentence**

Changed “tradition” to “natural law tradition.”

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## Afterword, last paragraph, first sentence

Changed “tradition” to “natural law tradition.”

## Appendix, first paragraph, first sentence

Changed “Just-In-Time” to “Just-In-Time (JIT).”

## Appendix, first paragraph, fourth sentence

Changed “it combines” to “JIT combines.”

## Appendix, Requirements for Kaizen, first paragraph, second sentence

Changed “cooperative” to “highly cooperative.”

## Appendix, Cooperation, second paragraph, second sentence

“Whether the employees’ trust in top management survives this depends on their trust in **its** dedication to the firm’s welfare.”

was changed to:

“Whether the employees’ trust in top management survives this depends on their trust in **management’s** dedication to the firm’s welfare.”

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## Changes in Version 2003.11.22

### Preface, first paragraph, first sentence

Changed “*Business and the Changing Environment*” to “*Business, Government, and the Changing Environment*.”

### Preface, first paragraph, second sentence

Changed “connect everything we had learned” to “lock everything we had learned together.”

### Preface, fifth paragraph, second to last sentence

Italicized “exactly.”

### Preface, fifth paragraph, second to last sentence

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Change Archive for 1998 – 2003

Changed “recognized” to “touched on.”

### **Preface, eleventh paragraph, argument, all**

Changed “complete conceptual system” to “perfect intellectual tool.”

### **Chapter 1, The Recursionist Strategy, first paragraph, last sentence**

Changed “global (universal)” to “universal (global)”.

### **Chapter 2, throughout**

Changed “global” to “universal.”

### **Chapter 2, *Theories produce predictions and explanations.*, last paragraph, last sentence**

“Failing to do so embeds ignorance into the economic system, which sets the stage for catastrophe.”

was deleted.

### **Chapter 2, *Theories are refinements of everyday thinking.*, last paragraph, second sentence**

“They also recognize that the complex interactions of the universe occasionally result in large asteroids colliding with earth. The universe is not as predictable as those who worshipped at Newton’s shrine believed it to be.”

was changed to:

“The universe is not as predictable as those who worshipped at Newton’s shrine believed it to be. Among other things, large asteroids occasionally collide with the earth, devastating its higher forms of life.”

### **Chapter 5, Increasing Excellence, last paragraph, second to last sentence**

“Everything else being equal, periods of great progress tend to coincide with rising prices, and periods of little or no progress tend to coincide with declining ones.”

was changed to:

“Everything else being equal, periods of heavy investment in new means tend to coincide with rising prices, and periods of little or no investment in new means tend to coincide with declining ones.”

## Boundless Pragmatism, An Invariant View of Deciding Well

Change Archive for 1998 – 2003

### Chapter 6, Introduction, last paragraph, last sentence

Changed “just taxation, and free association” to “free association, and just taxation.”

### Chapter 6, Just Taxation and Free Association

Switched *Just Taxation* and *Free Association*.

### Chapter 6, Just Taxation, first paragraph, second sentence

“Just forms disrupt it in ways that promote progress by creating incentives to act wisely.”

was changed to:

“By creating incentives to act wisely, just forms of taxation disrupt decision-making in ways that promote progress.”

### Chapter 6, Just Taxation, last paragraph

“The least beneficial taxes are those that discourage desirable activities. High on this list are taxes on incomes (**profits**), which discourage acquiring useful knowledge and taking risks. **Rather than taxing incomes progressively, we ought to demand that governments tax detrimental forms of consumption progressively.**”

was changed to:

“The least beneficial taxes are those that discourage desirable activities. High on this list are taxes on incomes, which discourage acquiring useful knowledge and taking risks.

“The case for eliminating corporate income taxes is straightforward. Depending on the nature of the demand for the products that the corporation sells, the burden of these taxes falls on either its customers or its owners. It would be better to tax customers and owners in ways that promote wise consumption.

“The case for eliminating personal income taxes is much more problematic. The wise satisfy their needs justly. If humans were perfectly wise, an increase in personal wealth would lead to an equivalent increase commonwealth (commonweal / general welfare). If humans were as lucid as angels, there would be no need for governments to redistribute income or wealth. Rather than demanding that governments redistribute income or wealth (per se), we ought to demand that governments encourage wise consumption.

“A just system for producing commonwealth produces not only commonwealth but also knowledge of how to produce commonwealth ever more wisely. A just system

## **Boundless Pragmatism, An Invariant View of Deciding Well**

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must ensure minimum standards of welfare, which governments can best provide. It must also ensure ever more efficient and effective means of providing welfare, which markets can best provide. These two solutions are not incompatible. Government and market based welfare systems can coexist, each providing what it provides best.

“An example of just mixed system for producing commonwealth is the combination of a government run welfare system paid for by progressive income taxes and a market based universal welfare system exempt from these taxes. The model for a market based universal welfare system is the tax exempt individual retirement account. Unlike the individual retirement account, a universal system would not be limited to a particular type of welfare. It would include not only the provision of retirement income but also medical expenses, unemployment compensation, education expenses, and financial support for qualified welfare providers. In effect, it would combine a universal family welfare savings account with a private charitable foundation. Expenditures to help related parties would be subject to limitations and/or taxation. Gifts to qualified charitable organizations would not be subject to limitations or taxation. Upon the death of the last exempt beneficiary, all funds not willed to qualified charitable organizations would be taxed at rate at least as progressive as that of the income tax system. The goal here is to provide a politically determined safety net while promoting the general welfare as efficiently and effectively as possible. Ideally, the government program would shrink to insignificance. However, it would never be eliminated. Like a militia, it would be available for emergencies.”

### **Chapter 6, Conclusion, last paragraph, last sentence**

“The strategy put forth in this work aims to increase this propensity by providing a conceptual framework for thinking more clearly about our ultimate ends and the best means to them.”

was changed to:

“The strategy put forth in this work aims to increase this propensity.”

### **Afterword, third paragraph, fourth sentence**

Changed “global ethical problem” to “universal (global) ethical problem.”

### **Afterword, seventh paragraph, second sentence**

Changed “global problem ” to “universal problem.”

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## **Changes in Version 2003.11.26**

### **Preface, first paragraph, second and third sentences**



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“Dean Bach intended his course to be the capstone of our Stanford MBA experience, **the course that would bring everything we had learned together into a coherent whole.** From the first day until the last, **Bach** relentlessly questioned our solutions to case studies without revealing his beliefs.”

was changed to:

“Dean Bach intended his course to be the capstone of our Stanford MBA experience. From the first day until the last, **he** relentlessly questioned our solutions to case studies without revealing his beliefs.”

### **Preface, third paragraph, second sentence**

Changed “realize” to “know.”

### **Preface, fourth paragraph, first sentence**

“**To make matters worse,** uncertainty about what it is that we ought to seek translates into uncertainty about which means is best.”

was changed to:

“**Further,** uncertainty about what it is that we ought to seek translates into uncertainty about which means is best.”

### **Preface, fifth paragraph, first sentence**

“The possibility of learning by doing makes **this theoretical problem of moral philosophy a very practical one.**”

was changed to:

“**To make matters worse,** the possibility of learning by doing makes **decision-making both more difficult and more crucial.**”

### **Preface, seventh paragraph, first sentence**

“Friedman’s solution **to the problem of not knowing what it is that we ought to seek** has had a negative unintended consequence.”

was changed to:

“**Unfortunately,** Friedman’s solution has had a negative unintended consequence.”

### **Preface, eleventh paragraph**

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“This radical solution **will** be resisted by intellectuals who **define the markets for intellectual tools to exclude everything but theories**. To these intellectuals, it takes a theory to beat a theory. They ought to consider the following **argument**:

“**A perfect intellectual tool** for helping us formulate alternatives **must** address all uncertainty. No theory can address the uncertainty of all of its own fundamental propositions. **Addressing all uncertainties associated with any given theory requires introducing a more complete theory**. Thus, a perfect intellectual tool for helping us formulate alternatives **must be based on a strategy for solving an open-ended problem**.”

was changed to:

“This radical solution **is likely to** be resisted by intellectuals who **believe** it takes a theory to beat a theory. Intellectuals **who define the markets for intellectual tools to exclude everything but theories** ought to consider the following:

“**A theory** for helping us formulate alternatives **ought to** address all uncertainty. No theory can address the uncertainty of all of its own fundamental propositions. **Only a strategy for solving an open-ended problem can address all uncertainty**.”

### **Preface, twelfth paragraph, second sentence**

Changed “Consumers” to “Users.”

### **Acknowledgments, first paragraph, first sentence**

Changed “recognize” to “acknowledge.”

### **Acknowledgments, fourth paragraph**

Switched this paragraph with the fifth.

### **Acknowledgments, new fourth paragraph, third sentence**

Deleted “, which effectively cut off the supply of paper to my father’s printing company.”

### **Acknowledgments, new fifth paragraph, second sentence**

Deleted “in college.”

### **Acknowledgments, last paragraph, last sentence**

Changed “ultimate end” to “normative end.”

### **Chapter 1, first paragraph, first sentence**

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Changed “localized” to “local.”

### Chapter 2, *Theories are tools for producing useful knowledge.*, first paragraph, second sentence

Changed “an artillery shell’s” to “a spacecraft’s.”

### Chapter 2, *Refining Everyday Thinking*, second sentence

“This book proposes a similar strategy for learning how to live ever more wisely, which involves slowly tightening a loose theory of means by removing ignorance in the form of theories of ultimate ends.”

was changed to:

“Similarly, the recursionist strategy for learning how to live ever more wisely involves slowly tightening a loose theory of means by removing ignorance in the form of theories of ultimate ends.”

### Chapter 2, *Theories produce predictions and explanations.*, third paragraph, last sentence

“Rather than better means of predicting what quantum mechanics predicts, physicists currently seek to explain what links subatomic phenomena and cosmological phenomena, e.g., string theory.”

was changed to:

“Rather than better means of predicting what quantum mechanics predicts, physicists currently seek to explain what links the subatomic to the cosmological, e.g., string and complexity theories.”

### Chapter 2, *Refining Recursionist Explanations*, third paragraph, last sentence

Changed “status quo” to “current state of the world.”

### Chapter 2, *Refining Recursionist Explanations*, last paragraph

“Explanations based on teleonomic theories are unique in that they both *describe what is* and *prescribe what we ought to seek*. These explanations describe our (fully realized) internal programming as it is. Following our (fully realized) internal programming leads to happiness, a life well-lived. Because we owe it to ourselves (ought) to live good lives, these explanations also prescribe what we ought to seek.”

was shortened and integrated into the last footnote.

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Change Archive for 1998 – 2003

### Chapter 3, Ultimate Normative Ends of Life, seventh through tenth paragraphs

“Each of us has a belief system, a structure of articulate knowledge. Some of our beliefs are critical to this system. When these key beliefs are challenged, we feel threatened. When we stop believing in them, we undergo a crisis that causes us to reevaluate other beliefs.

“Our beliefs influence what we perceive. Primitive tribesmen shown an electrocardiogram printout are likely to see a meaningless line on a piece of paper; bankers are likely to see an artifact of modern medicine; and cardiologists are likely to see a healthy or an ill heart.

“Our beliefs also influence how we interpret what happens to us as we go through life. If we believe that bad things only happen to bad people, a personal crisis is likely to cause us to question our worth, but if we believe that every crisis is a combination of threat and opportunity, we are likely to look for the opportunity.

“Finally, our beliefs influence our conception of ultimate ends. If we believe that we are put on this earth to please ourselves, we are likely to seek a life of pleasure, but if we believe that we are here for a higher purpose we are likely to seek to discover and fulfill that purpose. Beliefs that influence our conception of our ultimate ends are key beliefs.”

was changed to:

“Our beliefs influence what we perceive. Primitive tribesmen shown an electrocardiogram printout are likely to see a meaningless line on a piece of paper; bankers are likely to see an artifact of modern medicine; and cardiologists are likely to see health or disease..

“Our beliefs also influence how we interpret what happens to us as we go through life. If we believe that bad things only happen to bad people, a personal crisis is likely to cause us to question our worth, but if we believe that every crisis is a combination of threat and opportunity, we are likely to look for opportunity.

“Some of our beliefs are critical to our structure of beliefs. When these key beliefs are challenged, we feel threatened. When we stop believing in them, we undergo a crisis that causes us to reevaluate other beliefs.

“Beliefs that concern our ultimate ends are key beliefs. If we believe that we are put on this earth to please ourselves, we are likely to seek a life of pleasure, but if we believe that we are here for a higher purpose we are likely to seek to discover and fulfill that purpose.”

### Chapter 3, Practical Benefits of Magical Mysticism, ninth paragraph, last sentence

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Changed “massive and virtually immediate changes throughout the system” to “massive changes.”

### Chapter 3, Sacrifice versus Prudence, sixth paragraph, last sentence

Changed “promote” to “push.”

### Chapter 3, Eliminating Simplistic Theories, second paragraph, end of first sentence

“The fact that our needs emerge at more than one level of abstraction suggests that we should eliminate any theory that attributes human motivation to any one level of abstraction.”

was merged with preceding paragraph and changed to:

“This suggests that we should eliminate any theory that attributes human motivation to a single level of abstraction.”

### Chapter 3, Eliminating Simplistic Theories, new second paragraph, first sentence

“As previously stated, scientists search for predictable or explainable phenomena on different levels of abstraction: subatomic physicists look for patterns in matter at a subatomic level; chemists look for it on an atomic level; and astronomers look for it on a cosmic level.”

was deleted.

### Chapter 3, Eliminating Simplistic Theories, new third paragraph, first sentence

“Biologists taking this view hope to explain why organisms sometimes sacrifice themselves in order to allow related organisms to survive and reproduce.”

was merged with the preceding paragraph and changed to:

“Some of these biologists claim to explain why organisms sacrifice themselves.”

### Chapter 3, Eliminating Simplistic Theories, new eighth paragraph, last sentence

“The wise seek not to alleviate others’ pain, but to help others achieve their ultimate ends.”

was changed to:

“The wise seek to help others live good lives, not simply to lessen their pain.”

### Chapter 5, Economic Turbulence, second paragraph, fourth sentence

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“But if they fail to adopt the process and other firms subsequently enter the industry to exploit the new process, the result is likely to be inflation followed by unemployment.”

was merged with the preceding paragraph and changed to:

“However, if they fail to adopt the new process, which encourages new firms to enter the industry, the result is likely to be inflation followed by unemployment.”

### Chapter 6, Moral Vision, second paragraph

“Given the apparent success of libertarian economic policies in the past, libertarian economists may question why it is necessary for governments to push a moral vision. There are at least two reasons governments should do so. First, as we accumulate wealth, we tend to live higher in our hierarchy of needs, where identifying our current need is more difficult. The higher we are in this hierarchy, the more we need a vision to help us know what to do. Second, as we accumulate useful knowledge, the pace of change tends to increase, which makes following the virtuous path of accumulating wealth and accelerating change more difficult. A clear moral vision helps us cope with accelerating change.”

was changed to:

“Moral vision is especially useful in information age economies. As we accumulate wealth, we tend to live higher in our hierarchy of needs, where identifying our current need is more difficult. The higher we are in this hierarchy, the more we need a vision to help us know what to do. Further, as we accumulate useful knowledge, the pace of change tends to increase, which makes following the virtuous path of accumulating wealth and accelerating change more difficult. A clear moral vision helps us cope with accelerating change.”

### Afterword, last paragraph, first sentence

Deleted “natural law.”

### Appendix, Good People, first paragraph, first sentence

Changed “effective wage rates” to “wages.”

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## Changes in Version 2003.12.02

### Preface, title

““[E]ven the free market economists...have failed, as yet, to come to terms with the new role and inexhaustibility of knowledge.” — *Alvin and Heidi Toffler*”

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was deleted.

### Preface, third paragraph

“In retrospect, I wanted a unified theory of ethics, economics, and politics that would allow me to think outside all of the boxes that less complete theories create. **I did not know that all theories meant to guide our actions are inherently incomplete. This is because all such theories define what it is that we owe to ourselves (ought) to seek. How do we know whether this definition is complete or incomplete? We can’t without introducing another, more complete theory. We can never be certain about what it is that we ought to seek.**”

was merged with second paragraph and changed to:

“In retrospect, I wanted a unified theory of ethics, economics, and politics that would allow me to think outside all of the boxes that less complete theories create.”

### Preface, new third through sixth paragraphs

“Further, uncertainty about what it is that we ought to seek translates into uncertainty about which means is best. How can we know which road is best if we don’t know where it is that we ought to go?

“The possibility of learning by doing makes this theoretical problem of moral philosophy a very practical one. Our industrial age concept of excellence in means, efficiency, defines excellence to be a matter of using the least valuable scarce resources to achieve a given end. We can never be sure that the most efficient means to a given end that involves learning knowledge “X” is better than a less efficient means to the same end that involves learning knowledge “Y.” To be sure, we need to assign a value to knowledge “X” and “Y.” The inexhaustibility of knowledge — the fact that using knowledge does not deplete it — makes this impossible to do except in the very special case where we know exactly when and under what circumstances knowledge “X” and “Y” will be used in the future. We cannot know this without knowing *exactly* what it is that we ought to seek. (University of Chicago economist Frank Knight touched on this problem in his 1939 *Economica* article, *Ethics and Economic Reform*.)

“In his most cited academic work, *Essays in Positive Economics*, Milton Friedman proposed a brilliant solution to the problem of not knowing what it is that we ought to seek. His solution was to limit economic science to prediction. This limitation frees economists from having to worry about the realism of their assumptions. Whether economists assume that economic agents seek what is most wise, most efficient, or something else doesn’t matter. What matters is how well their models predict relative to other models.

“Unfortunately, Friedman’s solution has had a negative unintended consequence. Wise decision-making requires both theories that predict, which help us evaluate alternatives,

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and theories that explain, which help us formulate alternatives. By focusing the efforts of most economists on the former, his solution has retarded the development of the latter, particularly the development of Austrian economics. In his intellectual autobiography, *Hayek on Hayek*, Austrian economist F. A. Hayek wrote:

“[O]ne of the things I most regret is not having returned to a criticism of Keynes’s treatise, but it is as much true of not having criticized Milton Friedman’s [*Essays in*] *Positive Economics*, which in a way is quite as dangerous a book.””

were deleted.

### Preface, new third paragraph

“The major problem in developing intellectual tools for helping us formulate alternatives is both simple and straightforward: To be most effective, intellectual tools for helping us formulate alternatives must be based on what we would do if we had complete knowledge of what we ought to seek. How can we know what we don’t know?”

was changed to:

“To be most effective, intellectual tools for helping us formulate alternatives must be based on what we would do if we had complete knowledge of what we ought (owe to ourselves) to seek. How can we know what we don’t know?”

### Preface, new fourth paragraph

“Fortunately, the solution is also both simple and straightforward: How can we know what we don’t know? We can learn by doing.”

was deleted.

### Preface, new fourth paragraph, end

Added the following:

“How can we know what we don’t know? We can learn by doing.”

### Preface, new fifth paragraph, second sentence

Changed “Individuals” to: “Those.”

### Preface, new fifth paragraph, second sentence

Changed “These intellectuals” to: “They.”



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## Acknowledgments, title

““If I have seen further it is by standing on the shoulders of Giants.” — *Isaac Newton*”

was deleted.

## Chapter 1, title

“(designations, concepts)” was deleted.

## Chapter 1, Modern Economics' Blind Spot, first paragraph, sentence, and word

Changed “Concepts” to “Words (designations, concepts).”

## Chapter 1, Modern Economics' Blind Spot, fifth paragraph, first sentence

“Concepts focus our attention on certain **characteristics of** objects, which tends to blind us to other **characteristics.**”

was changed to

“Concepts focus our attention on certain objects, which tends to blind us to others.”

## Chapter 2, *Theories produce predictions and explanations.*, last paragraph, fifth through eighth sentences

“We **predict behavior based on the world as it is. In economics, we** predict our **collective** behavior based on the knowledge that we currently possess. **We could choose to** explain our **individual** behavior **on this same basis. However, if we do**, we will tend to blind ourselves to the possibility of learning. **If we are to** avoid this, we need to explain our behavior based on *how we would act if we had **greater** knowledge.*”

was changed to:

“We predict our behavior based on the knowledge that we currently possess. **If we** explain our behavior **based on the knowledge we currently possess**, we will tend to blind ourselves to the possibility of learning. **To** avoid this, we need to explain our behavior based on *how we would act if we had complete knowledge **of what we ought to seek.***”

## Chapter 3, Eliminating Simplistic Theories, new third paragraph

“The problem with this theory of altruism when applied to humans is that it ignores many examples in which thinking organisms that reproduce sexually have sacrificed themselves for less than the theory predicts. One only has to consider the many cases of saints and heroes who have sacrificed themselves for far less than it predicts to see

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that it falls short of explaining human altruism. This inadequacy is not limited to humans: news stories of family dogs sacrificing themselves to save the life of a human family member are common. Further, most people find this version of altruism to be selfish, which itself is evidence that this theory is incomplete.”

was changed to:

“There are two problems with the selfish gene theory as a theory of human altruism. First, it predicts poorly. History is filled with saints and heroes who have sacrificed themselves for far less than it predicts. Second, most of us find its conclusions to be selfish, which makes it a very poor foundation for helping us find better problems to solve. When applied to humans, selfish gene theory is fatally incomplete.”

### Afterword, first paragraph, second sentence

Changed “nearly five years ago” to “five years ago.”

### Afterword, second to last paragraph, second to fifth sentences

“Conservative elites once claimed that the United States owed its success to their Protestant heritage. Their children claimed it was their **Christian** heritage. Their grandchildren claim it was their Judeo-Christian heritage. Their great-grandchildren will likely claim it was their Abrahamic heritage.”

was changed to

“Conservative elites once claimed that the United States owed its success to their **Anglo-Saxon** Protestant heritage. Their children claimed it was their **Protestant** heritage. **Their grandchildren claimed it was their Christian heritage.** Their great-grandchildren claim it was their Judeo-Christian heritage. Their **great-great-**grandchildren will likely claim it was their Abrahamic heritage.”

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## Changes in Version 2003.12.06

### Preface, second paragraph, second sentence

Deleted “my great uncle.”

was deleted.

### Preface, last paragraph, fourth sentence

Italicized “including good intellectual tools.”

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## Chapter 6, Just Taxation, sixth paragraph

“A just system for producing commonwealth produces not only commonwealth but also knowledge of how to produce commonwealth ever more wisely. A just system must ensure minimum standards of welfare, which governments can best provide. It must also ensure ever more efficient and effective means of providing welfare, which markets can best provide. These two solutions are not incompatible. Government and market based welfare systems can coexist, each providing what it provides best.”

was changed to:

“A just system ensures both minimum standards of welfare and ever wiser means of producing commonwealth. Governments best ensure the former and markets the latter.”

## Chapter 6, Just Taxation, seventh paragraph, first sentence

“An example of just mixed system for producing commonwealth is the combination of a government run welfare system paid for by progressive income taxes and a market based universal welfare system exempt from these taxes. The model for a market based universal welfare system is the tax exempt individual retirement account. Unlike the individual retirement account, a universal system would not be limited to a particular type of welfare. It would include not only the provision of retirement income but also medical expenses, unemployment compensation, education expenses, and financial support for qualified welfare providers. In effect, it would combine a universal family welfare savings account with a private charitable foundation. Expenditures to help related parties would be subject to limitations and/or taxation. Gifts to qualified charitable organizations would not be subject to limitations or taxation. Upon the death of the last exempt beneficiary, all funds not willed to qualified charitable organizations would be taxed at rate at least as progressive as that of the income tax system. The goal here is to provide a politically determined safety net while promoting the general welfare as efficiently and effectively as possible. Ideally, the government program would shrink to insignificance. However, it would never be eliminated. Like a militia, it would be available for emergencies.”

was merged with the preceding paragraph and changed to:

“For example, a just system might combine a government run safety net program paid for by progressive income taxes with a tax exempt universal welfare savings account program. The latter would allow tax free expenditures for qualified retirement, medical, unemployment, and educational expenses. It would also allow unlimited giving to qualified charitable organizations. Upon the death of the last exempt beneficiary, all funds not willed to qualified charitable organizations would be taxed at rate at least as progressive as that of the income tax system. Ideally, the government program would shrink to insignificance over time. However, it would never be eliminated. Like a militia, it would remain available for emergencies.”

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## Chapter 6, Conclusion, second paragraph, last sentence

Changed “Decentralization” to “Freedom.”

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### Changes in Version 2003.12.10

#### Chapter 6, Control the Money Supply Passively, last paragraph, last sentence

“In the long run, do we want economic agents to learn to adapt to economic turbulence or to economic turbulence modified by activist monetary authorities?”

was replaced by the following paragraph:

“Recursionist monetary policy aims at eliminating the causes of turbulence, not turbulence per se. It seeks to dampen turbulence only when turbulence threatens the political stability of the system. Hence, the more robust the political system is, the faster progress is likely to be.”

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### Changes in Version 2003.12.12

#### Chapter 2, Refining Everyday Thinking

Added the following subsection:

“*Theories that explain are partial descriptions.* We understand a system completely if and only if we can predict it with absolute certainty under all circumstances. Ideally, theories that explain are simply theories that predict “written backwards.”

“Modern physics tells us that we can never predict physical systems with absolute certainty under all circumstances. The idealistic assertion that theories that explain are theories that predict “written backwards” is useless. Practically, theories that explain are partial descriptions of our world that we use to find problems to solve.”

#### Chapter 2, Refining Recursionist Explanations, fourth paragraph, last sentence

Added the following footnote:

<sup>4</sup> Teleonomic theories *describe* our internal programming as it is. Because we owe it to ourselves (ought) to live good lives, these explanations also *prescribe* what we ought to seek. For more on this apparent contradiction of David Hume, read part two of Mortimer Adler’s *Ten Philosophical Mistakes* (New York: Macmillan, 1985).”

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## Chapter 2, Refining Recursionist Explanations, last two paragraphs

“Although we can safely assume that our **fully realized** internal programming is fixed, we **do not know, and may never know completely, what this internal programming** is. The most we can know is what it is not. **Thus**, the process of solving **the** universal economic problem **must** include **the process of** eliminating inadequate **teleonomic** theories **from the set of all teleonomic theories**.

*“Rather than basing evolutionary explanations on what we currently want, which ignores the possibility of solving problems by learning to live more wisely, we can base them on the set of all teleonomic theories. Over time we can tighten these loose explanations by eliminating members of this set.”*

were replaced by:

“Although we can safely assume that our internal programming is fixed, we **will never know with complete certainty what it** is. The most we can know is what it is not. The process of solving **our** universal economic problem **ought to** include eliminating inadequate theories of our internal programming.

*“Rather than basing evolutionary explanations on what we currently want, which ignores the possibility of solving problems by learning to live more wisely, we can base them on the set of all teleonomic theories. Over time we can tighten these loose explanations by eliminating members of this set.”*

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## Changes in Version 2003.12.20

### Chapter 2, *Theories produce predictions and explanations.*, second paragraph, last sentence

“In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate,” **which “emerges” from the complex interactions of the elements of the system.**”

was changed to:

“In the long term, the best we can hope to do is to predict the bounds of the trajectory, the “climate.””

### Chapter 2, *Theories that explain are partial descriptions.*,

***“Theories that explain are partial descriptions. We understand a system completely if and only if we can predict it with absolute certainty under all circumstances. Ideally, theories that explain are simply theories that predict “written backwards.”***

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Modern physics tells us that we can never predict physical systems with absolute certainty under all circumstances. The idealistic assertion that theories that explain are theories that predict “written backwards” is **useless**. Practically, theories that explain are partial descriptions of our world that we use to find problems to solve.”

was changed to:

***“Theories that explain are partial descriptions.*** Ideally, **a single theory explains and predicts everything about a system:** theories that explain are simply theories that predict “written backwards.” Modern physics tells us that we can never predict physical systems with absolute certainty under all circumstances. The idealistic assertion that theories that explain are theories that predict “written backwards” is **a poor foundation for studying most systems, particularly complex adaptive ones.** Practically, theories that explain are partial descriptions of our world that we use to find problems to solve.”

### Chapter 6, Free Association, third paragraph

“Just as we can tell many stories about why cultures become more hedonistic as they become more urban, industrial, and market-oriented, we can tell many stories about why cultures are likely to become more lucid as they become knowledge intensive. The practical question for just policy makers is not whether there is a trend toward lucidity but rather how best to promote **such a** trend.”

was changed to:

“Just as we can tell many stories about why cultures become more hedonistic as they become more urban, industrial, and market-oriented, we can tell many stories about why cultures are likely to become more lucid as they become **more** knowledge intensive. The practical question for just policy makers is not whether there is a trend toward lucidity but rather how best to promote **this** trend.”

### Chapter 6, Conclusion, second paragraph, last sentence

“Freedom is a means to the ultimate end of a good life for all, not an end in itself.”

was deleted.

### Appendix, Introduction, second paragraph

“What makes the Toyota **Production System** exemplary is its information age organization and management, which focuses on continual improvement (*kaizen*) in production, trade, **and consumption**. It is the epitome of learning-by-doing. From this **information age** perspective, more production of saleable product is not necessarily more productive. Less “production” can be more productive.”

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was changed to:

“What makes the Toyota **s**ystem exemplary it its information age organization and management, which focuses on continual improvement (*kaizen*) in production, trade, **and consumption**. It is the epitome of **an information age**, learning-by-doing **strategy**. From this perspective, more production of saleable product is not necessarily more productive. Less “production” can be more productive.”

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### Changes in Version 2003.12.23

#### Chapter 3, Sacrifice versus Prudence, sixth paragraph, last sentence

“Illiberal leaders push sacrifice over prudence, romance over enlightenment, **and heroism over wisdom**.”

was changed to:

“Illiberal leaders push sacrifice over prudence and romance over enlightenment.”

#### Chapter 3, Sacrifice versus Prudence, last paragraph, last sentence

“The wise temper sacrifice with prudence, romance with enlightenment, **and heroism with wisdom**.”

was changed to:

“The wise temper sacrifice with prudence **and** romance with enlightenment.”

#### Chapter 6, Control the Money Supply Passively, last paragraph, last sentence

“Hence, the more robust the political system is, the faster progress is likely to be.”

was deleted.

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### Changes in Version 2003.12.29

#### Acknowledgments, third paragraph, first sentence

Added “Santa Fe Institute economist.”

#### Chapter 1, The Recursionist Strategy, fourth paragraph, second sentence

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“*Given a learning attitude*, waste from imperfect decision-making is a regrettable by-product of learning through experience.”

was changed to:

“*From this perspective*, waste is a regrettable by-product of learning through experience.”

### Chapter 1, The Recursionist Strategy, fifth paragraph, fourth sentence

Added “gladiatorial games.”

### Chapter 2, *Theories that explain are partial descriptions.*, last three sentences

“Modern physics tells us that we can never predict physical systems with absolute certainty under all circumstances. The idealistic assertion that theories that explain are theories that predict “written backwards” is a poor foundation for studying most systems, particularly complex adaptive ones. Practically, theories that explain are partial descriptions of our world that we use to find problems to solve.”

were changed to:

“We test theories that explain by how well they predict. Practically, theories that explain are partial descriptions of our world that we use to find problems to solve. We test theories by how well they perform their function. We test theories that explain by how well they help us find problems to solve.”

### Chapter 2, *Theories are refinements of everyday thinking.*, fifth paragraph, third and fourth sentences

“The practical means of testing tools is to test their performance at the task they were designed to perform. Thus, the practical means of testing philosophical theories is to test how well they help us find problems to solve.”

were changed to:

“Practically, we test philosophical theories by how well they help us find problems to solve.”

### Chapter 2, *Theories are refinements of everyday thinking.*, seventh paragraph, first sentence

“Consider how we would have used this pragmatic approach to science to refine early modern theories about our solar system.”

was changed to:



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“Consider how we would have used this **decision-oriented** pragmatic approach to science to refine early modern theories about our solar system.”

### **Chapter 2, *Theories are refinements of everyday thinking.*, ninth paragraph, second and third sentences**

“Given the greater depth and breadth of Newton’s theories of gravity and mechanics, we would **not have rejected them as either theories that predict or ones that explain**. However, Newton’s discovery that calculating the trajectories of the earth, moon, and sun was practically impossible would have prevented us from enshrining Newton’s theories as Alexander Pope did when he wrote:”

were changed to:

“Given the greater depth and breadth of Newton’s theories of gravity and mechanics, we would **have accepted them as the leading theories that predict and explain**. However, Newton’s discovery that calculating the trajectories of the earth, moon, and sun was practically impossible would have prevented us from enshrining Newton’s theories **as the sacred truth** as Alexander Pope did when he wrote:”

### **Chapter 3, *Eliminating Unethical Theories*, third paragraph, third sentence**

“In contrast, temporal ends are goals that concern events **that** are bounded in time.”

was changed to:

“**Processes are not bounded in time**. In contrast, temporal ends are goals that concern events. **Events** are bounded in time.”

### **Chapter 3, *Eliminating Unethical Theories*, third paragraph, fifth and sixth sentences**

“Winning a particular basketball game **and sinking a particular free throw are** temporal ends. **In the current context**, satisfying those things that we need in order to live a good life is a normative end **and** satisfying a particular need is a temporal end.”

were changed to:

“Winning a particular basketball game **is a** temporal end. **Satisfying** those things that we need in order to live a good life is a normative end. **Satisfying** a particular need is a temporal end.”

### **Chapter 3, *Eliminating Unethical Theories*, fourth paragraph, last sentence**

“It is a statement of fact.”

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was changed to:

“It is a statement of fact: True believers in Marxist-Leninism called on individuals to satisfy their human need for mystical unity by submitting to the will of the people as interpreted by Marxist-Leninist leaders.”

### Chapter 3, *Ultimate Normative Ends of Life*, first paragraph, last two sentences

“For this statement to be true by definition, living a good life must include all temporal worldly ends necessary to achieve the ultimate end of human existence. Further, living a good life must be logically consistent with these temporal ends.”

was changed to:

“For it to be true by definition, living a good life must include all temporal worldly ends necessary to achieve the ultimate end of human existence.”

### Chapter 3, *Ultimate Normative Ends of Life*, second paragraph, first sentence

“Humanist philosophers claim that the statement, “the ultimate normative end of human life is living a good life,” has meaning, as opposed to simply being true by definition.”

was changed to:

“Humanist philosophers claim that the statement, “the ultimate normative end of human life is living a good life,” has meaning.”

### Chapter 5, A Simple Model of Progress and Turbulence, last paragraph, first sentence

Changed “weakly chaotic model” to “complex adaptive analogue to a weakly chaotic system.”

### Chapter 5, A Simple Model of Progress and Turbulence, last paragraph, last sentence

Changed “the symptoms” to “these symptoms.”

### Afterword, eleventh paragraph, sixth sentence

Changed “political and economic turbulence” to “economic turbulence.”

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Changes in Version 2003.12.31

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## Title page

Changed “The Reintegration of Ethics and Economics” to “The Economics of Practical Wisdom.”

## Preface, first paragraph, first sentence

Changed “The Reintegration of Ethics and Economics” to “The Economics of Practical Wisdom.”

## Chapter 3, Eliminating Unethical Theories, fourth paragraph, first two sentences

“We also need to **distinguish between ethics and religion. Ethics concerns how we live good lives.**”

was changed to:

“We also need to **define ‘religion.’**”

## Chapter 3, *Ultimate Normative Ends of Life*, first paragraph

“Humanists look to human nature (**teleonomic theories**) to explain human ends. They **believe that the ultimate normative end of human life is living a good life. Some humanists believe that this is self-evident. This ignores the possibility that the ultimate normative end of life and the ultimate normative end of existence may not be the same thing. For the statement “the ultimate normative end of human life is living a good life” to be true, it must be true by definition. For it to be true by definition, living a good life must include all temporal worldly ends necessary to achieve the ultimate end of human existence.**

“**Humanist philosophers** claim that the statement, “the ultimate normative end of human life is living a good life,” has meaning. To have meaning, a statement must tell us something more than is contained in the statement alone. In this case, the statement has meaning because it focuses our attention on what we need in order to live a good life.”

was changed to:

“Humanists look to human nature to explain human ends. They claim that the statement, “the ultimate normative end of human life is living a good life,”<sup>2</sup> has meaning. To have meaning, a statement must tell us something more than is contained in the statement alone. In this case, the statement has meaning because it focuses our attention on what we need in order to live a good life.”

<sup>2</sup> Some humanists believe that this statement is self-evident. This is to say that we cannot imagine a case in which the ultimate normative end of human life is living a

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good life as defined by our internal programming is false. We don't need to imagine such a case. History is filled with examples of prophets claiming that achieving particular temporal ends is not only the best way but also the only way to live a good life. (Living a good life must include all temporal ends necessary to achieve the ultimate end of human existence.)”

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## Summary of Changes by Year

- 1998 – page 1 (5 pages)
- 1999 – page 6 (3 pages)
- 2000 – page 9 (13 pages)
- 2001 – page 22 (10 pages) First change on 9/17/2001.
- 2002 – page 32 (162 pages) “It takes an intellectual tool to beat an intellectual tool.”
- 2003 – page 194 (90 pages)
- 2004 – archive #2 (239 pages)
- 2005 – archive #3 (280 pages) “The Science of Practical Wisdom”